EPA/ROD/R04-01/533
2001

EPA Superfund
Record of Decision:

CHERRY POINT MARINE CORPS AIR STATION
EPA ID: NC1170027261
OU 03
HAVELOCK, NC
10/24/2000

059609/P

RECORD OF DECISION
FOR
OPERABLE UNIT 3

MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Atlantic Division
Environmental Restoration Branch, Code 1823
Naval Facilities Engineering Command
1510 Gilbert Street
Norfolk, Virginia 23511-2699

Submitted by:
Tetra Tech NUS, Inc.
600 Clark Avenue, Suite 3
King of Prussia, Pennsylvania 19406-1433

CONTRACT NUMBER N62472-90-D-1298
CONTRACT TASK ORDER 0239

AUGUST 2000

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

OCT 24 2000

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

4WD-FFB

Commanding General, MGen. Thomas A. Braaten
Marine Corps Air Station-Cherry Point
Attention: Mr. William Powers
Environmental Affairs Department
Marine Corps Air Station, PSC Code 8006
Cherry Point, North Carolina 28533-0006

SUBJ: Record of Decision - Operable Unit 3
MCAS Cherry Point, North Carolina

Dear General Braaten:

The U.S. Environmental Protection Agency (EPA) Region 4 has reviewed the above subject decision document for Operable Unit 3 (OU3) and concurs with the selected remedies for soil and groundwater. The remedy selected for groundwater is a combination of monitored natural attenuation and institutional controls. For the contaminated soil areas, the remedy is a combination of enhanced in-situ bioremediation and institutional controls. This remedy is supported by the previously completed Remedial Investigation Report (December 1996) and the Feasibility Study Report (December 1996).

This remedial action is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action and is cost effective. Should EPA receive new or additional information that significantly affects this concurrence, it may be modified or withdrawn with appropriate written notice to the Navy, Air Sation and the State of North Carolina.

EPA appreciates the coordination efforts of MCAS Cherry Point and the level of effort that was put forth in the documents leading to this decision. EPA looks forward to continuing the exemplary working relationship with MCAS Cherry Point as we move toward final cleanup of the NPL site.

Sincerely,

Richard D. Green, Director
Waste Management Division
EPA, Region 4

cc: Glenn P. Markwith, LANTNAVFACENGCOM
Linda Raynor, NCDENR
Dale McFarland, MCAS

Commander, Atlantic Division, Naval Facilities Command
LANTNAVFACENGCOM
Mr. Steve Martin
1510 Gilbert Street
Norfolk, VA. 23511-2699

NCDENR

JAMES B. HUNT JR.
GOVERNOR

WAYNE MCDEVITT
SECRETARY

WILLIAM L. MEYER
DIRECTOR

NORTH CAROLINA DEPARTMENT OF
ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT

August 29, 2000

Commanding General, MGen. Thomas A. Braaten
Marine Corps Air Station – Cherry Point
Attention: Mr. William Powers
Environmental Affairs Department (L.N.)
Marine Corps Air Station, PSC Code 8006
Cherry Point, NC 28533-0006

Subject: **Record of Decision for Operable Unit 3**
(Document dated August 2000)
MCAS-Cherry Point, North Carolina

Dear General Braaten:

The NC Superfund Section has completed its review of the Record of Decision (ROD) for Operable Unit 3 and concurs with the selected remedy. The remedy selected for groundwater is a combination of monitored natural attenuation and institutional controls, and for contaminated soil areas, the remedy is a combination of enhanced in-situ bioremediation and institutional controls.

This concurrence is based on the information presented in the ROD (dated August 2000), the Remedial Investigation Report for OU-3 (dated December 1996) and the Feasibility Study Report (dated December 1996). Should the State receive new or additional information that significantly affects this concurrence, it may be modified or withdrawn with appropriate written notice to the Navy, Air Station and EPA Region IV.

Our concurrence with this Record of Decision in no way binds the State to concur in future decisions or commits the State to participate, financially or otherwise, in the cleanup of the site. The State reserves the right to review, comment, and make independent assessments of all future work relating to the site.

If you have any questions regarding this concurrence, or any other matter concerning Operable Unit 3, please call either Ms. Linda F. Raynor at (919) 733-2801, extension 340, or myself at (919) 733-2801, extension 291.

Sincerely,

Grover Nicholson
Federal Remediation Branch
NC Superfund Section

401 OBERLIN ROAD, SUITE 150, RALEIGH, NC 27605
PHONE 919-733-4996 FAX 919-715-3605

Cc: Commander, Atlantic Division, Naval Facilities Command
Attention: LANTNAVFACENGCOM
Mr. Steve Martin
Code 1823
1510 Gilbert Street
Norfolk, VA 23511-2699

Rob Gelblum, NC Attorney General's Office
Beth Hartzell, NC Hazardous Waste Section
David May, NC Division of Water Quality, WARO
Michelle Thornton, US EPA, Region IV

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in hazardous substances remaining on site above levels that allow for unlimited use and unrestricted exposure, a review will be conducted within 5 years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

T.A. BRAATEN
Major General, U.S. Marine Corps
Commanding General
Marine Corps Air Station, Cherry Point

18 SEPTEMBER 2000
Date

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LIST OF ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
BEHP	Bis(2-ethylhexyl)phthalate
BGS	Below Ground Surface
CDI	Chronic Daily Intake
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cm	Centimeter
CNS	Central Nervous System
COC	Chemical of Concern
COPC	Chemical of Potential Concern
CSF	Cancer Slope Factor
CSV	Chemical-specific value
CY	Cubic Yard
DERA	Defense Environmental Restoration Account
DL	Detection limit
DON	Department of Navy
EPA	Environmental Protection Agency
FS	Feasibility Study
FY	Fiscal year
GI	Gastrointestinal
GIS	Geographic Information System
HEAST	Health Effects Assessment Summary Table
HI	Hazard Index
HpCDD	Heptachlorodibenzo-p-dioxin
HpCDF	Heptachlorodibenzofuran
HQ	Hazard Quotient
HRS	Hazard Ranking System
HxCDF	Hexachlorodibenzofuran
IAS	Initial Assessment Study
ICR	Incremental Cancer Risk
ILCR	Incremental Lifetime Cancer Risk
IRIS	Integrated Risk Information System
IRP	Installation Restoration Program

kg	Kilogram
L	Liter
LUCAP	Land Use Control Assurance Plan
LUCIP	Land Use Control Implementation Plan
m	Meter
MCAS	Marine Corps Air Station
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg	Milligram
MSL	Mean Sea Level
NA	Not Analyzed
NADEP	Naval Aviation Depot
NCAC	North Carolina Administrative Code
NCDENR	North Carolina Department of Environment and Natural Resources
NCGS	North Carolina General Statues
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ND	Not Detected
NPL	National Priorities List
NPW	Net Present Worth
O&M	Operation and Maintenance
OCDD	Octachlorodibenzo-p-dioxin
OCDF	Octachlorodibenzofuran
OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
POL	Petroleum, Oil, and Lubricants
ppb	Parts per Billion
ppm	Parts per Million
PRAP	Proposed Remedial Action Plan
RA	Remedial Action
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RFI	RCRA Facility Investigation
RGO	Remedial Goal Option
RI	Remedial Investigation

ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SMP	Site Management Plan
STP	Sewage Treatment Plant
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TBC	To Be Considered
TCDD	Tetrachlorodibenzo-p-dioxin
TCL	Target Compound List
TDM	Technical Direction Memorandum
TEF	Toxicity Equivalence Factor
TRC	Technical Review Committee
UCL	Upper Confidence Level
UF	Uncertainty Factor
µg	Microgram
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
USMC	U.S. Marine Corps
VOC	Volatile Organic Compound

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DECLARATION

Site Name and Location

Operable Unit 3 (Site 6 - Fly Ash Ponds and Site 7 - Old Incinerator and Adjacent Area)
Marine Corps Air Station
Cherry Point (Craven County), North Carolina

Statement of Basis and Purpose

This decision document presents the selected remedial action for Operable Unit 3 (OU3) at the Marine Corps Air Station (MCAS), Cherry Point, North Carolina. The remedy was chosen in accordance with the federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for OU3. Although this remedy is considered the final Record of Decision (ROD) under CERCLA, this remedy is considered an interim measure under the federal Resource Conservation and Recovery Act (RCRA). Currently the North Carolina Hazardous Waste Section, which administers the RCRA program, has no regulations or guidance in place to allow for any cleanup levels in lieu of residential levels.

The Department of the Navy (DON) and the Marine Corps have obtained concurrence on the selected remedy from the State of North Carolina Department of Environment and Natural Resources (NCDENR) and the U.S. Environmental Protection Agency (USEPA) Region IV.

Assessment of the Site

Actual or threatened releases of hazardous substances from this operable unit, if not addressed by implementing the response action selected in this ROD, present a potential threat to public health, welfare, or the environment.

Description of Selected Remedy

OU3 is one of 15 operable units at MCAS Cherry Point. Separate investigations and assessments are being conducted for these other operable units in accordance with CERCLA. Therefore, this ROD applies only to OU3. The remedy calls for the design and implementation of response measures that will protect human health and the environment. The remedy addresses sources of contamination as well as soil and groundwater contamination, which are the principal threats posed by the site.

The selected remedy for OU3 is institutional controls at both Sites 6 and 7 (Alternative 2), monitored natural attenuation of groundwater contaminated with fuel-related compounds at Site 7, and enhanced bioremediation of an isolated area of soil contaminated with fuel-related compounds at Site 7.

The selected remedy includes the following major components:

- Monitored natural attenuation is the selected remedy for the groundwater contamination. The goals of this remediation are twofold: first to remediate the current levels of contamination in the groundwater, and second to contain any future releases from the waste/fill remaining at the site.

- Enhanced in-situ bioremediation will be conducted for an isolated area of soil contaminated with fuel-related compounds at Site 7.

- MCAS Cherry Point shall conduct long-term monitoring to evaluate the effectiveness of the natural attenuation process. Long-term monitoring will also serve to ensure that no further releases from other contaminated media will cause unacceptable risks to human health and the environment. A monitoring plan, which shall be prepared and carried out in accordance with appropriate federal and state regulations and guidance and with the concurrence of USEPA and NCDENR, will be developed to detail the frequency, media type, analysis, and locations of the long-term monitoring samples. The plan shall require, at a minimum, collection and analysis of groundwater samples and of surface water and sediment samples from Slocum Creek and Luke Rowe's Gut. Based on the results of the monitoring, USEPA or NCDENR may require additional sampling and analysis, and/or remedial actions. Changes to the monitoring plan (including changes to sample frequency, media samples, sample locations, analyses performed, and installation or abandonment of monitoring wells) may be required by USEPA or NCDENR, or proposed by MCAS Cherry Point, based on review of results from the regular monitoring program or other circumstances. Changes to the monitoring plan shall be submitted to USEPA and NCDENR for concurrence as non-significant changes to the ROD. Monitoring may be discontinued upon demonstration that continued attainment of remedial goals has been achieved. A request for discontinuation of the monitoring program shall be submitted for USEPA and NCDENR concurrence and documented as a non-significant change to the ROD.

- Institutional controls, which include land use restrictions, groundwater/aquifer use restrictions, and site access restrictions as specified and outlined in the attached Land Use Control Implementation Plan (LUCIP).

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in hazardous substances remaining on site above levels that allow for unlimited use and unrestricted exposure, a review will be conducted within 5 years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

T. A. BRAATEN
Major General, U.S. Marine Corps
Commanding General
Marine Corps Air Station, Cherry Point

18 SEPTEMBER 2000
Date

DECISION SUMMARY

1.0 SITE NAME, LOCATION, AND DESCRIPTION

Marine Air Corps Station (MCAS) Cherry Point is part of a military installation located in southeastern Craven County, North Carolina, just north of the town of Havelock. The Air Station covers approximately 11,485 acres. It is bounded on the north by the Neuse River, on the east by Hancock Creek, and on the south by North Carolina Highway 101. The irregular western boundary line lies approximately three-quarters of a mile west of Slocum Creek. The general location of the Air Station is shown on ***Figure 1-1***.

The study area, Operable Unit 3 (OU3), is one of 15 operable units located within MCAS Cherry Point. An "operable unit," as defined by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), is a discrete action that comprises an incremental step toward comprehensively addressing site problems. With respect to MCAS Cherry Point, operable units were developed to combine one or more individual sites where Installation Restoration Program (IRP) activities are or will be implemented.

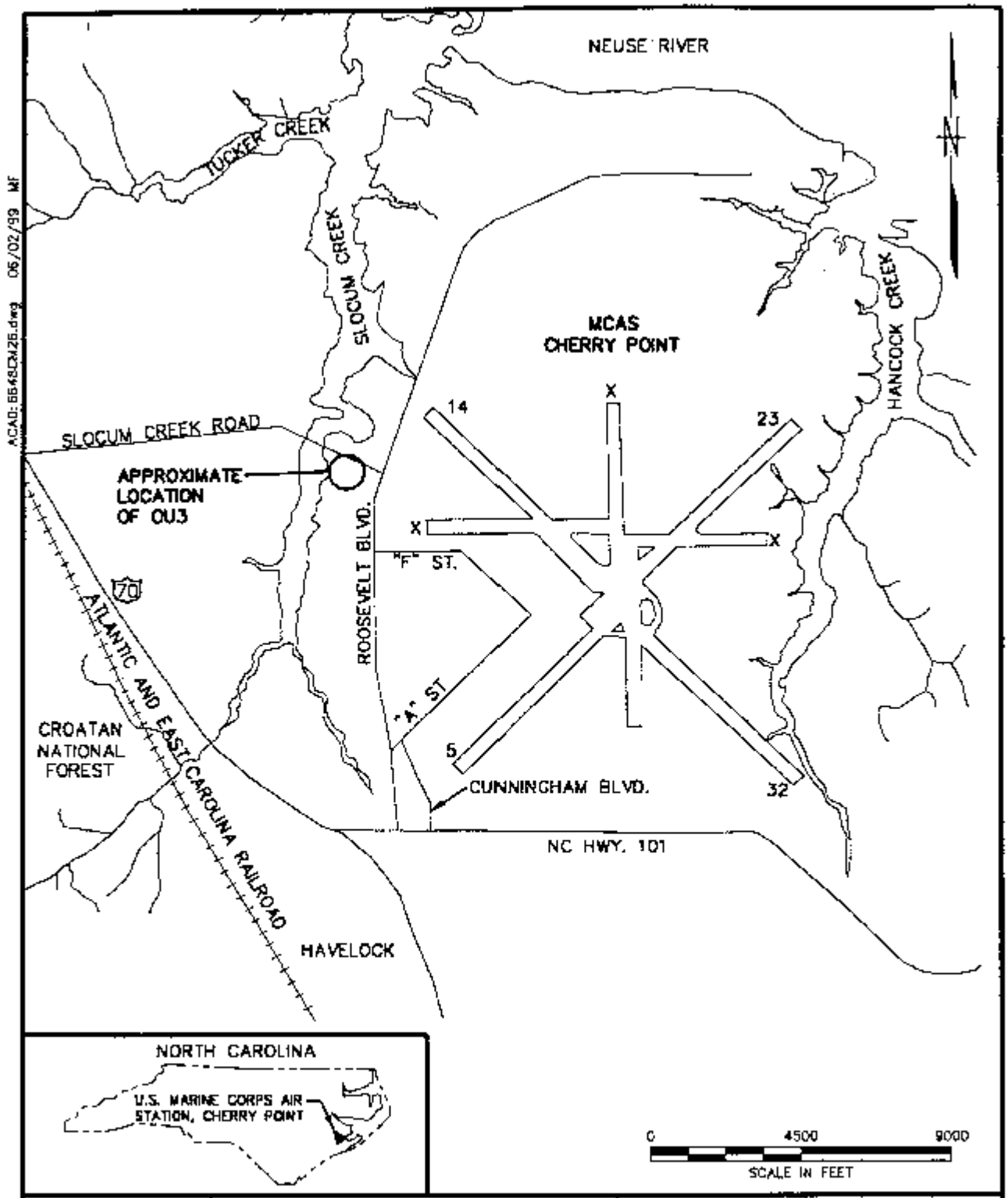
OU3 is located in the west-central portion of the Air Station on the east bank of Slocum Creek, as shown on ***Figure 1-2***. It is bounded by the MCAS Cherry Point Sewage Treatment Plant (STP) to the south, Roosevelt Boulevard to the east, Slocum Creek Road to the north, and Slocum Creek to the west (***Figure 1-3***). OU3, the subject of this Record of Decision (ROD), consists of two sites:

- Site 6 - Fly Ash Ponds
- Site 7 - Old Incinerator and Adjacent Area

These sites have been grouped into one operable unit because of their proximity to each other.

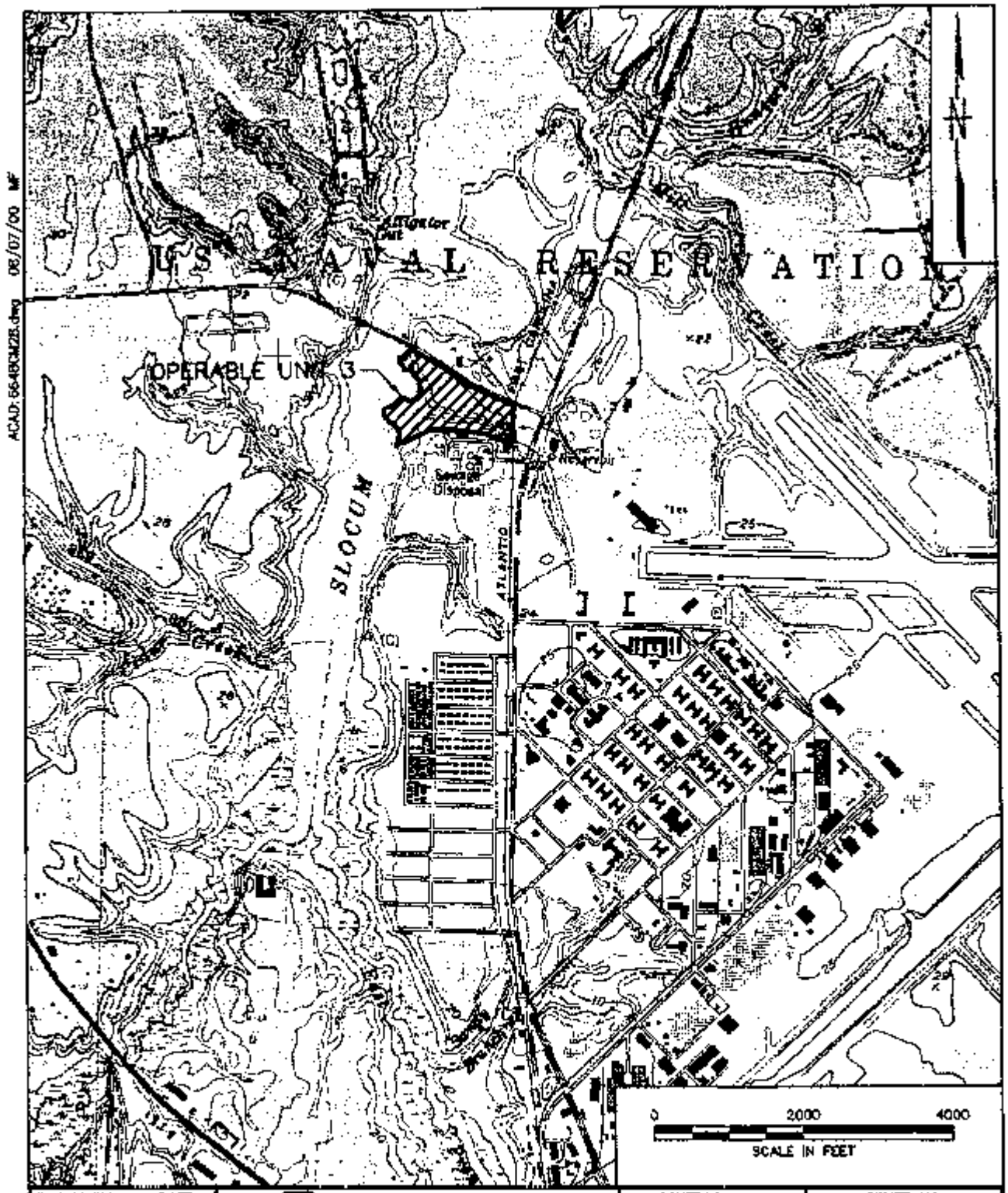
1.1 SITE 6 - FLY ASH PONDS

Site 6 consisted of three unlined ponds located south of Slocum Road. The ponds covered about 2.5 acres and were about 10 feet deep. From the 1940s until about 1970, Site 6 reportedly received a slurry of fly ash and cinders from the old power plant located across Slocum Creek Road. The ponds were then reportedly used for the disposal of lime/alum sludge from the old potable water treatment plant from December 1980 to mid-1994. During the time the ponds were used for the disposal of lime/alum sludge, each of the ponds was dredged annually. Between 1994 and 1997, no disposal activities occurred at the site. The new water treatment plant, which went on-line in 1994, does not generate lime/alum sludge. Residual lime/alum sludge (and sometimes rainwater) may have existed in the ponds. The remaining



DRAWN BY MF DATE 6/2/99	Tetra Tech NUS, Inc.	CONTRACT NO. 6648	OWNER NO. 0239
CHECKED BY DATE	LOCATION MAP MCAS CHERRY POINT, NORTH CAROLINA	APPROVED BY DATE	
COST/SCHED-AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 1–1	REV. 0

FORM CADD NO. TtNUS_AV.DWG – REV 0 – 1/22/98



DRAWN BY MF DATE 6/3/99	Tetra Tech NUS, Inc.	CONTRACT NO. 6648	OWNER NO. 0239
CHECKED BY DATE	OPERABLE UNIT 3 GENERAL AIR STATION MAP MCAS CHERRY POINT, NORTH CAROLINA	APPROVED BY DATE	
COST/SCHED–AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 1–2	REV. 0

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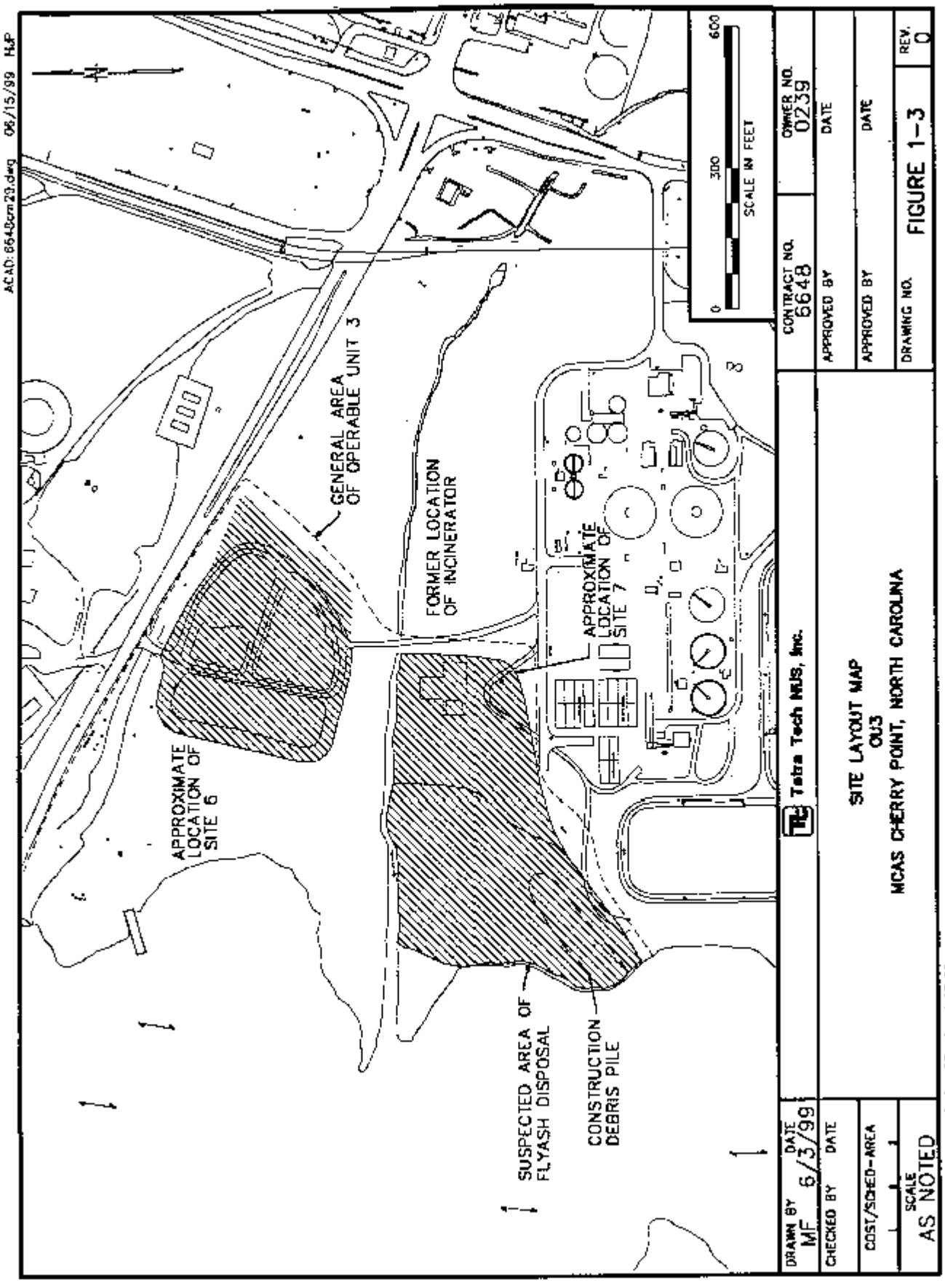

ACAD: 6648cm23.dwg 06/15/99 H&P
GENERAL AREA OF OPERABLE UNIT 3
FORMER LOCATION OF INCINERATOR
APPROXIMATE LOCATION OF SITE 7
APPROXIMATE LOCATION OF SITE 6
SUSPECTED AREA OF FLYASH DISPOSAL
CONSTRUCTION DEBRIS PILE
0
300
600
SCALE IN FEET
Tetra Tech NUS, Inc.
SITE LAYOUT MAP
OU3
MCAS CHERRY POINT, NORTH CAROLINA
CONTRACT NO. 6648
OWNER NO. 0239
APPROVED BY
DATE
APPROVED BY
DATE
DRAWING NO. FIGURE 1-3
REV. 0
DRAWN BY MF DATE 6/3/99
CHECKED BY DATE
COST/SQFED-AREA
SCALE AS NOTED
FORM CADD MD TEMPLATE.DWG - REV 0 - 1/22/98

lime/alum sludge was removed, the ponds were filled in, and the entire area was regraded and planted with pine seedlings in Spring 1997 as the final step in the Air Station's closure of the old water treatment plant.

1.2 SITE 7 - OLD INCINERATOR AND ADJACENT AREA

Site 7 was an incinerator and open burning ground that covered approximately 5 acres. It is bounded by the STP, Luke Rowe's Gut, and Slocum Creek. From 1949 until 1955, waste petroleum, oil, and lubricants (POL), Naval Aviation Depot (NADEP) wastes, and other wastes such as municipal refuse were burned either in the incinerator or on the ground adjacent to the unit. No records were kept on the types or quantities of waste disposed of at this unit. Fly ash was disposed of at this site but was mixed with other waste/fill material. The fly ash is believed to have originated from the incinerator. The site is currently vegetated with grass, brush, and trees, with the heaviest vegetation along the stream banks. A fence was installed around the southern and eastern perimeters of Site 7 in Spring 1997. In addition, warning signs were placed along the fence and Slocum Creek and at the mouth of Luke Rowe's Gut.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Air Station was commissioned in 1942 to maintain and support facilities, services, and materiel of a Marine Aircraft Wing and other units as designated by the Commandant of the Marine Corps.

The following subsections describe the history (i.e., past land use and waste disposal practices) of Sites 6 and 7 and summarize the previous site investigations and enforcement activities.

2.1 SITE HISTORY

The northern portion of OU3 (Site 6) consisted of three unlined ponds located south of Slocum Creek Road. The ponds covered about 2.5 acres and were about 10 feet deep. From the 1940s until about 1970 Site 6 reportedly received a slurry of fly ash and cinders from the old power plant located across Slocum Creek Road. Aerial photographs of the site indicate that the existing ponds were not constructed until the late 1950s, when two ponds were constructed, but earlier photographs indicate the presence of a natural pond and shallow depressions. A third pond appears in the 1978 aerial photographs. The ponds were reportedly used from December 1980 to mid-1994 for the disposal of lime/alum sludge from the potable water treatment plant. During the time the ponds were used for the disposal of lime/alum sludge, each of the ponds was dredged annually. Each dredging event resulted in the removal of approximately 5,000 cubic yards of sludge from each pond. The material was hauled away by a contractor. No specific destination was identified in the contracts, but most of the material was reportedly sent to local large corporation farms. Between 1994 and 1997, no disposal activities occurred at the site because the lime/alum sludge was no longer generated by the new water treatment plant, which went on-line in 1994. The remaining lime/alum sludge was removed, the ponds were filled in, and the entire area was regraded and planted with pine seedlings in Spring 1997 as the final step in the Air Station's closure of the old water treatment plant.

The southern half of OU3 (Site 7) was an incinerator and open burning ground that covered approximately 5 acres. It is bounded by the STP, Luke Rowe's Gut, and Slocum Creek. From 1949 until 1955, waste POL, NADEP wastes, and other wastes such as municipal refuse were burned either in the incinerator or on the ground adjacent to the unit. No records were kept of the types or quantities of waste disposed of at this unit. Fly ash was disposed of at this site but was mixed with other waste/fill material. The fly ash is believed to have originated from the incinerator itself. The aerial photographs of Site 7 indicate that the incinerator was removed between 1981 and 1984. A fence was installed along the southern and eastern perimeters of Site 7 in Spring 1997. In addition, warning signs were placed along the fence and Slocum Creek and at the mouth of Luke Rowe's Gut.

2.2 PREVIOUS INVESTIGATIONS AND ENFORCEMENT ACTIVITIES

OU3 has been under investigation since 1984. The OU3 sites (6 and 7) were identified in the Initial Assessment Study (IAS) prepared by a Navy contractor. These sites were also included in a multi-task RCRA Section 3008(h) Administrative Order on Consent signed by the Navy and the USEPA in December 1989. The Administrative Order on Consent was incorporated by reference into the State RCRA Part B Permit for MCAS Cherry Point which was first issued in 1992. MCAS Cherry Point was placed on the National Priorities List (NPL), which was established under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), in December 1994. As a result, IR investigations are being conducted to meet the requirements of both CERCLA and the Resource Conservation and Recovery Act (RCRA).

The nature and extent of contamination at OU3 has been under investigation since 1984. The work was conducted using a phased approach that was based on the availability of funding and the prioritization of sites in terms of potential environmental impacts. The work was conducted under several environmental programs in accordance with regulatory requirements in effect at the time. Information pertaining to these investigations is contained in the following documents:

- Remedial Investigation (RI) Interim Report, October 1988 (NUS Corporation): Provides the results of groundwater, surface water, and sediment sampling and analysis conducted at Sites 6 and 7 under the IR Program.

- RCRA Facilities Investigation (RFI) - 21 Units, June 1993 (Halliburton NUS Corporation): Provides the results of soil, groundwater, and sediment sampling and analysis at Sites 6 and 7 conducted following signing of the RCRA Consent Order.

- Technical Direction Memorandum (TDM) - 10 Units, August 1993 (Halliburton NUS Corporation): Provides the results of additional soil and groundwater sampling and analysis conducted at Sites 6 and 7 to address data gaps identified upon completion of the RFI.

- RI Report, December 1996 (Brown & Root Environmental): Presents the results of soil, groundwater, surface water, and sediment sampling conducted in 1994; soil and groundwater data collected in 1995; and soil and surface water data collected in 1996. Summarizes data collected from past investigations.

The ponds at Site 6 have been removed as the final step in the Air Station's closure of the old water treatment plant. Based on public comments and agreements that were incorporated into the Draft ROD, portions of the remedy have been implemented. These include the installation of an air sparge system, fence, and warning signs at Site 7. No other enforcement activities, removal actions, or remediation activities have been initiated at OU3.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

Throughout the site's history, the community has been an active participant in activities in accordance with CERCLA Section 113(k)(2)(B)(i-v) and 117. In 1988, a Technical Review Committee (TRC) was formed to review recommendations for and monitor progress of the investigation and remediation efforts at MCAS Cherry Point. The TRC was made up of representatives of the Navy, USEPA, U.S. Fish and Wildlife Service, U.S. Geological Survey, U.S. Forest Service, National Oceanographic and Atmospheric Administration, NCDENR, Craven County Fire Marshal, and U.S. Marine Corps. In June 1995, a Restoration Advisory Board (RAB) was established as a forum for communications between the community and decision-makers. The RAB absorbed the TRC and added members from the community. The RAB members work together to monitor progress of the investigations and to review remediation activities and recommendations at MCAS Cherry Point. RAB meetings are held regularly.

The Remedial Investigation and Feasibility Study (RI/FS) Report and Proposed Remedial Action Plan (PRAP) documents for OU3 at MCAS Cherry Point were released to the public on August 1, 1996. These documents were made available to the public in an Administrative Record and information repositories maintained at the Havelock Public Library and the MCAS Cherry Point Library. A notice of the availability of these documents was published in the Havelock News on July 31, 1996; the Windsock on August 1, 1996; the Carteret County News - Times on July 28, 1996; and the Sun Journal on July 28, 1996. A public comment period was held from, August 1, 1996 to August 30, 1996. In addition, a public meeting was held on August 22, 1996. At this meeting, representatives from the Navy, MCAS Cherry Point, USEPA, and NCDENR answered questions about problems at the site and the remedial alternatives under consideration. A response to the comments received during the public comment period is included in the Responsiveness Summary, which is part of this ROD (Section 14). This decision document presents the selected remedial action for OU3, MCAS Cherry Point, North Carolina, chosen in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA), and the NCP. The decision for OU3 is based on the Administrative Record.

4.0 SCOPE AND ROLE OF OPERABLE UNIT 3

Fifteen operable units have been defined at MCAS Cherry Point based on contaminant similarity, source similarity, and physical proximity of the contaminated sites. OU3 is the third of 15 operable units at the facility for which a ROD has been prepared. The sites that comprise OU3 were combined because of physical proximity, similar contaminants associated with the sites, and the contaminated groundwater beneath the sites. One operable unit, OU12, has been deferred to the State of North Carolina's underground storage tank program. The remaining operable units at the Air Station are being investigated as part of a comprehensive Air Station investigation. The timing and coordination of these investigations have been addressed in the MCAS Cherry Point Site Management Plan (SMP).

This selected remedy is the first and final remedial action for OU3. The function of this remedy is to reduce risks to human health and the environment associated with exposure to buried wastes and contaminated groundwater and soil.

The potential exposure to contaminated soil and groundwater under a future residential exposure scenario at OU3 constitutes the principal risks to human health. In addition, the hypothetical exposure of construction workers to contaminated soil at Site 7 also produces risks to human health. The selected remedy identified in this Decision Summary for contaminated soil and groundwater at OU3 will eliminate or minimize risks to human health and the environment.

The major components of the remedy are:

- Monitored natural attenuation of groundwater.

- Enhanced in-situ bioremediation of an isolated area of soil contaminated with fuel-related compounds at Site 7.

- Institutional controls.

- Groundwater, surface water, and sediment monitoring program to ensure that natural attenuation will be effective and to confirm that contaminants are not migrating into the environment. The monitoring program will continue until a five-year review concludes that the alternative has achieved continued attainment of the performance standards (see ***Table 11-1***) and remains protective of human health and the environment.

This remedy addresses the first and final cleanup action planned for OU3, where surficial aquifer groundwater contains elevated concentrations of contaminants. Although this water-bearing zone is affected, the contamination is not affecting the public drinking water supply. The purpose of this proposed action is to prevent current and future potential exposure to contaminated soil and groundwater and to reduce the migration of contaminants.

This is the only ROD contemplated for OU3. Separate investigations and assessments are being conducted for the other sites at MCAS Cherry Point in accordance with CERCLA. Therefore, this ROD applies only to OU3.

5.0 SITE CHARACTERISTICS

This section of the ROD presents an overview of the physical characteristics and land use of OU3.

5.1 PHYSICAL CHARACTERISTICS

MCAS Cherry Point is located in the Coastal Plain of North Carolina. Ground surface elevations at OU3 range from 17 feet to 20 feet mean sea level (msl) at the highest points at Sites 6 and 7, respectively, to approximately 1.5 feet msl at the banks of Slocum Creek.

OU3 is bounded on the west by Slocum Creek, which flows northward past the site. Luke Rowe's Gut is a perennial stream that flows between Sites 6 and 7 into Slocum Creek. Luke Rowe's Gut is a freshwater body, whereas Slocum Creek is a tidal saltwater body. The soils at the site are generally poorly drained and acidic. They are also subject to ponding and seasonal high water tables. Low-lying areas along the streams are subject to flooding.

Information on the stratigraphy at OU3 is derived from published U.S. Geological Survey (USGS) documents and the onsite boring logs. The surficial material at OU3 consists of both natural material (sand, silt, and clay) mixed with fill (black silty fly ash, charred wood, metal fragments, and glass fragments). Natural material at OU3 consists of yellow-brown and grey silty sand with local peat deposits and is generally found to be 25 feet thick.

At Site 6, a 2-foot-thick, black silt layer believed to be fly ash was encountered beneath a 2-foot-thick layer of soft grey silt and clay (lime/alum sludge) below two of the fly ash (lime/alum sludge) ponds. Black fly ash was also found in borings in the berms and around the perimeter of the ponds and in the OU3MW06 well boring, located 100 feet east of the ponds.

Site 7 is divided into two portions, with the western portion of Site 7 being the suspected area of fly ash disposal and open burning (as shown on ***Figure 1-3***). The eastern portion, although not used as extensively for fly ash disposal as the western portion, also had fly ash deposited in places. At Site 7, a black fill material was encountered from the ground surface to a depth of 10 feet below ground surface (bgs) in three soil borings believed to approximate the boundary separating the suspected area of fly ash disposal and open burning from the remaining portion of the site. Because soil borings were terminated at the water table, the full vertical extent of fill material is not known at these locations. However, based on other borings at Site 7, up to 15 feet of fill material may be present. Fly ash was also found in some soil borings on the eastern portion of the site.

The surficial aquifer is the uppermost aquifer of the study area and is exposed at the ground surface and in streambeds throughout the Air Station. This aquifer consists of unconsolidated and interfingering beds of fine sand, silt, clay, shell, and peat beds, as well as scattered deposits of coarser-grained material believed to represent relic beach ridges and alluvium. Groundwater beneath OU3 was encountered in the surficial aquifer at approximately 2 to 10 feet bgs, and water-level elevations ranged from approximately 1.35 to 7.46 feet msl.

The groundwater in the surficial aquifer flows toward and discharges into either Slocum Creek or Luke Rowe's Gut. The lime/alum sludge ponds at Site 6 were unlined and acted as a recharge zone for the surficial aquifer, the result of which was a mounding of the water table in this area. The groundwater flowed in a radial pattern away from the ponds toward Slocum Creek and Luke Rowe's Gut.

Underlying the surficial aquifer is the Yorktown confining unit. It consists of an olive green to grayish green, dense, fine sand with varying amounts of shell fragments, clay, and silt. One boring was extended through this confining unit to install a monitoring well in the Yorktown aquifer. The confining unit was 21 feet thick at this location.

The Yorktown aquifer is described as a gray, silty sand with varying amounts of shell fragments. A dark green, clayey silt and clayey sand were encountered in the Lower Yorktown well at a depth of 68 feet. These materials signify the presence of the underlying Pungo River confining unit. The thickness of this confining unit was not determined because the unit was not penetrated during the drilling activities.

Potable water used at the Air Station and in the adjacent town of Havelock comes from the Castle Hayne aquifers. These aquifers lie at depths of approximately 195 feet or more bgs, below the Pungo River aquifer and the Castle Hayne confining unit. All groundwaters at the Air Station, including the surficial aquifer, are classified as GA waters by the state of North Carolina. Such groundwater is considered to be an existing or potential source of drinking water.

The state surface water classification for Slocum Creek is Class SC saltwater. Class SC waters are classified as suitable for aquatic life propagation and maintenance of biological integrity, wildlife, secondary recreation, and any other use except primary recreation or shellfishing for marketing purposes. The state surface water classification for Luke Rowe's Gut is Class C freshwater. Class C waters are classified as suitable for aquatic life propagation and maintenance of biological integrity, wildlife, secondary recreation, agriculture, and any other use except for primary recreation or a source of water supply for drinking, culinary, or food processing purposes.

The Air Station has an active fish and wildlife management program designed to protect all native wildlife species and their habitat, make fish and wildlife resources available on a continuing basis, and enhance fish and wildlife resources. Numerous game and nongame species exist at the Air Station. Slocum Creek and its tributaries are designated by the North Carolina Natural Heritage Program as a critical environmental area that is considered to be essential to the conservation and management of rare species (both state and federal). In addition, the Air Station has management programs for endangered and threatened species known to exist at or migrate through the area. These include the bald eagle, American alligator, red-cockaded woodpecker, and loggerhead turtle.

5.2 LAND USE

Current land use at Site 6 and Site 7 is vacant, unused land. The eastern portion of Site 7 had been used as a storage area for construction work, but was vacated after the completion of the RI. Consequently all of Site 7 is now vacant land. The projected land use at these two sites, as identified in the Cherry Point Complex Master Plan (September 1980), is classified as utilities. The area classified as utilities in the Master Plan includes the Sewage Treatment Plant south of Site 7 and the electric substation north of Site 6.

All groundwater at the Air Station, including the surficial aquifer, is classified as GA waters by the state of North Carolina. Such groundwater is considered to be an existing or potential source of drinking water. The potable water used at the Air Station and in the adjacent town of Havelock comes from the Castle Hayne aquifers, which are separated from the surficial aquifer by the Yorktown, the Pungo River, and the Castle Hayne confining layers. The nearest potable water supply well is located approximately 1,400 feet northwest of OU3.

There are no plans to develop the surficial aquifer at the Air Station as a source of water because of its low yield and poor quality. In addition, there are no plans to develop any groundwater beneath OU3 as a source of water, because any future development of groundwater as a water supply is planned for areas north of OU3 (more remote areas of the Air Station).

6.0 NATURE AND EXTENT OF CONTAMINATION

Soil, groundwater, surface water, and sediment samples were collected and analyzed for a variety of parameters to determine the nature and extent of contamination at OU3. This section summarizes the data collected and documented in the RI report.

6.1 SOIL

6.1.1 Surface Soil

Surface soil samples, defined as soils collected from depths of 1 foot or less, were collected from Sites 6 and 7. These sites are discussed separately because the nature and extent of contamination differ.

6.1.1.1 Site 6

One surface soil sample was collected during the 1993 TDM supplemental investigation, and six surface soil samples were collected during the 1996 investigation. ***Table 6-1*** summarizes the surface soil sampling results for Site 6.

Few organics were detected in the surface soil at Site 6. Only one volatile organic compound (VOC) (chloroform at 3 micrograms per kilogram [µg/kg]), one semivolatile organic compound (SVOC) (bis[2-ethylhexyl]phthalate with a maximum concentration of 160 µg/kg), and one polychlorinated biphenyl (PCB) (Aroclor-1260 with a maximum concentration of 29 µg/kg) were detected in the surface soil at Site 6.

Dioxins were also detected in the surface soil samples analyzed for dioxins. The congeners detected include only heptachlorodibenzo-p-dioxin (HpCDD), heptachlorodibenzofuran (HpCDF), octachlorodibenzofuran (OCDF), and octachlorodibenzo-p-dioxin (OCDD). These congeners are the least toxic of the chlorinated dibenzo-p-dioxins and furans.

While the concentrations of the metals found in the surface soil at Site 6 were higher than the range of reported background values, they were much lower than the concentrations reported in the surface soil at Site 7.

6.1.1.2 Site 7

Three surface soil samples and one duplicate were collected during the 1993 TDM. Twelve surface soil samples were collected during the 1995 supplemental investigation. Because only two of the samples collected from Site 7 at a depth of 0 to 1 foot were analyzed for pesticides/PCBs, and none of the

TABLE 6-1

**SURFACE SOIL ANALYTICAL RESULTS (0 TO 1 FOOT) – SITE 6
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA**

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections	Average Background Concentration[1]
Volatile Organics (µg/kg)				
Chloroform	1/6	3	3	5[2]
Semivolatile Organics (µg/kg)				
Bis(2-ethylhexyl)phthalate	3/6	102	63 – 160	75[2]
Pesticides/PCBs/Dioxins/Furans (µg/kg) – (0 to 2 feet)				
Aroclor-1260	2/6	28	27 – 29	ND[3]
1,2,3,4,6,7,8-HpCDD	1/2	0.0061	0.0061	NA[4]
1,2,3,4,6,7,8-HpCDF	1/2	0.0056	0.0056	NA
OCDD	2/2	0.1076	0.1010 – 0.1142	NA
OCDF	2/2	0.0104	0.0064 – 0.0143	NA
Total HpCDD	1/2	0.0061	0.0061	NA
Total HpCDF	1/2	0.0056	0.0056	NA
Inorganics (mg/kg)				
Aluminum	7/7	4,190	1,230 – 9,960	5,080
Antimony	1/2	15.5	15.5	ND
Arsenic	6/7	11.8	0.82 – 54.3	1.95
Barium	6/7	198	19.2 – 732	11.5
Beryllium	4/7	1.13	0.21 – 02.3	0.221
Calcium	5/7	91,900	3,530 – 231,000	256
Chromium	5/7	10.3	6.6 – 16	8.48
Cobalt	1/7	4.6	4.6	1.19
Copper	6/7	12.7	0.77 – 31.8	1.88
Iron	7/7	8,330	1,190 – 22,900	2,980
Lead	7/7	5.68	0.9 – 11.0	5.26
Magnesium	6/7	1,680	134 – 3,090	211
Manganese	7/7	37.3	5.6 – 90.1	8.36
Mercury	3/7	0.12	0.09 – 0.15	0.064
Nickel	4/7	7.35	1.5 – 13.8	3.45
Potassium	6/7	325	37.2 – 977	241
Selenium	2/7	2.25	2.1 – 2.4	0.28
Sodium	5/7	175	124 – 244	25.5
Vanadium	6/7	24.8	6 – 55.4	9.58
Zinc	3/7	18.8	12.2 – 26	5.66

1 The values presented are the average of all of the results reported for this compound calculated using one-half the detection limit for non-detects.
2 The average exceeded the maximum detection; therefore, the maximum is reported.
3 ND – Not-detected.
4 NA – Not analyzed.

samples were analyzed for dioxins, six samples and two duplicates collected from the 0- to 2-foot interval during the 1994 RI activities were also used to define the nature and extent of these analytes in surface soil. ***Table 6-2*** summarizes the surface soil sampling results for Site 7.

At Site 7, the disposal of fly ash and the open burning of debris associated with the former incinerator appear to have resulted in notable contamination with both organic and inorganic compounds.

Polynuclear aromatic hydrocarbons (PAHs) were prevalent surface soil contaminants. The noncarcinogenic PAHs are typically more prevalent than the carcinogenic PAHs. Most individual PAHs are found at concentrations between 10 and 1,000 µg/kg. The concentrations are much higher within the disposal area. Only one soil sampling location outside the disposal area contained PAHs.

Dioxins were also detected in several surface soil samples (0 to 2 feet deep). The congeners detected include only hexachlorodibenzofuran (HxCDF), HpCDD, HpCDF, and OCDD. As noted above, these are the least toxic of the chlorinated dibenzo-p-dioxins and furans. Tetrachlorodibenzo-p-dioxin (TCDD) equivalent concentrations ranged from 0.00116 µg/kg to 0.165 µg/kg.

PCBs were detected in two surface soil samples (0 to 2 feet bgs) from the northern and southern portions of the disposal area. Aroclor-1260 was detected at a concentration of 210 µg/kg, and Aroclor-1248 was detected at a concentration of 190 µg/kg. Pesticides were detected sporadically throughout Site 7 at relatively low concentrations (maximum concentration for 4,4'-DDD was 480 µg/kg).

VOCs were also detected sporadically at Site 7. The most prevalent VOC detected was trichloroethene, which was detected in 4 of 12 samples. It was also the VOC detected at the highest concentration (50 µg/kg).

A sample collected from the southeastern portion of the disposal area contained the highest concentrations of many metals, including chromium, lead, silver, zinc, and cyanide.

The results indicate that Site 7 was an area of significant waste disposal activity, the contaminants detected (metals, PAHs, and dioxins) indicate that fly ash was placed here, and open burning probably occurred in localized areas. The concentrations of many of the heavy metals exceed those reported in the background soil samples.

TABLE 6-2

**SURFACE SOIL ANALYTICAL RESULTS (0 TO 1 FOOT) – SITE 7
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2**

Analyte	Frequency of Detection	Average of Positive Results	Range of Positive Detections	Average Background Concentration[1]
Volatile Organics (µg/kg)				
Benzene	2/12	2.5	2 – 3	ND[2]
1,2-Dichloroethene	2/12	8	2 – 14	ND
Ethylbenzene	2/12	3	1 – 5	4[3]
Styrene	1/12	3	3	ND
Tetrachloroethene	3/12	5.3	2 – 8	ND
Toluene	2/12	5.5	3 – 8	5.5
1,1,1-Trichloroethane	1/12	4	4	ND
1,1,2-Trichloroethane	1/12	4	4	ND
Trichloroethene	4/12	15	2 – 50	ND
Xylenes	2/12	11.5	7 – 16	ND
Semivolatile Organics (µg/kg)				
Acenaphthene	5/12	55.6	21 – 88	ND
Anthracene	9/12	96.3	33 – 270	ND
Benzo(a)anthracene	11/12	356	110 – 710	ND
Benzo(a)pyrene	11/12	325	100 – 530	ND
Benzo(b)fluoranthene	7/12	509	160 – 740	ND
Benzo(g,h,i)perylene	10/12	297	100 – 460	ND
Benzo(k)fluoranthene	10/12	330	120 – 650	ND
Bis(2-ethylhexyl)phthalate	3/12	2,610	440 – 6,800	75[3]
Carbazole	5/12	41	24 – 96	ND
Chrysene	12/12	341	22 – 640	ND
Dibenz(a,h)anthracene	10/12	135	48 – 240	ND
Dibenzofuran	2/12	42.5	35 – 50	ND
Fluoranthene	11/12	660	210 – 1,600	ND
Fluorene	3/12	69	52 – 79	ND
Indeno(1,2,3-cd)pyrene	11/12	246	72 – 400	ND
2-Methylnaphthalene	4/12	89.8	25 – 270	ND
Naphthalene	3/12	110	41 – 230	ND
Phenanthrene	11/12	398	120 – 990	ND
Pyrene	12/12	489	33 – 1,200	ND
Pesticides/PCBs/Dioxins/Furans (µg/kg) – (0 to 2 feet)				
Aldrin	1/6	6.9	6.9	ND
alpha-BHC	1/6	2.0	2.0	ND
alpha-Chlordane	6/8	53.1	6.15 – 220	1.09
gamma-Chlordane	4/6	47.4	1.7 – 170	1.02
4 4'-DDD	4/5	170	18 – 480	2.0
4,4'-DDE	6/7	37.6	13.5 – 57	0.625[3]
4,4'-DDT	2/4	23.6	6.1 – 41	0.56[3]
Dieldrin	4/6	32.4	5.5 – 59	1.1[3]
Endosulfan I	1/6	10	10	6.43[3]
Endosulfan II	3/5	7.53	1.6 – 17	0.64[3]
Endrin	3/7	20.6	1.8 – 39	ND
Endrin aldehyde	1/4	18	18	ND
Aroclor-1248	1/6	190	190	ND

TABLE 6-2

**SURFACE SOIL ANALYTICAL RESULTS (0 TO 1 FOOT) – SITE 7
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 2**

Analyte	Frequency of Detection	Average of Positive Results	Range of Positive Detections	Average Background Concentration[1]
Aroclor-1260	1/7	210	210	ND
1,2,3,6,7,8-HxCDF	1/6	0.19	0.19	NA[4]
1,2,3,6,7,8-HpCDD	3/6	0.947	0.64 – 1.48	NA
1,2,3,6,7,8-HpCDF	1/6	0.39	0.39	NA
OCDD	5/6	5.36	1.16 – 12.74	NA
Total HxCDF	1/6	1.0	1.0	NA
Total HpCDD	3/6	2.0	2.0	NA
Total HpCDF	1/6	1.0	1.0	NA
Inorganics (mg/kg)				
Aluminum	15/15	10,400	3,250 – 26,800	5,080
Antimony	11/14	71.2	1.5 – 134	ND
Arsenic	14/15	15.5	2.6 – 29.3	1.95
Barium	15/15	429	10.1 – 784	11.5
Beryllium	11/15	0.42	0.27 – 0.73	0.221
Cadmium	15/15	44.0	0.32 – 107	0.564
Calcium	13/15	23,600	2,430 – 43,200	256
Chromium	15/15	87.7	6.6 – 212	8.48
Cobalt	13/15	11.7	0.4 – 23.4	1.19
Copper	14/15	1,960	14.7 – 12,600	1.88
Cyanide	9/10	0.761	0.2 – 2.0	0.308
Iron	15/15	65,100	2,510 – 152,000	2,980
Lead	14/15	1,870	9.6 – 9,000	5.26
Magnesium	13/15	1,990	205 – 3,720	211
Manganese	15/15	606	10.9 – 1,240	8.36
Mercury	14/15	2.11	0.4 – 4.4	0.064
Nickel	13/15	93.9	1.3 – 302	3.45
Potassium	9/14	508	113 – 898	241
Selenium	5/15	3.24	0.98 – 6.0	0.28
Silver	14/15	23.8	1.3 – 46.9	0.405
Sodium	11/15	351	42.8 – 751	25.5
Vanadium	15/15	21.6	6.6 – 57.4	9.58
Zinc	15/15	2,240	7.3 – 4,850	5.66

1 The values presented are the average of all of the results reported for this compound calculated using one-half the detection limit for non-detects.
2 ND – Not detected.
3 The average exceeded the maximum detection; therefore, maximum is reported.
4 Not analyzed.

6.1.2 Subsurface Soil

This section discusses the analytical results for soil samples collected from depths greater than one foot, including samples collected from the depth interval of 0 to 2 feet. As with the surface soil samples, Sites 6 and 7 are discussed separately.

6.1.2.1 Site 6

Five subsurface soil samples were collected during the TDM. Four soil/sediment samples were collected from beneath the fly ash (lime/alum sludge) ponds during the RI based on the assumption that past use of the ponds for fly ash quenching had resulted in contaminated soil that was not removed when the fly ash was dredged. Five subsurface soil samples and one duplicate sample were collected during the 1996 investigation. ***Table 6-3*** summarizes the subsurface soil sampling results for Site 6.

Minimal contamination was noted at Site 6 in the subsurface soil samples. Several VOCs were detected in one sample at low concentrations (acetone at 705 µg/kg, 2-butanone at 15 µg/kg, and carbon disulfide at 16.5 µg/kg). Chloroform (5 µg/kg) was detected in one of the samples collected from beneath the fly ash (aluminum sludge) ponds. The soil samples collected from beneath the ponds also contained bis(2-ethylhexyl)phthalate (670 µg/kg) and di-n-butylphthalate. Di-n-butylphthalate was detected in all four samples from beneath the ponds at concentrations ranging from 240 to 720 µg/kg. Bis(2-ethylhexyl)phthalate was also detected in two of the samples collected from around the ponds.

One sample contained several pesticides at concentrations of 1 µg/kg or less. The detected compounds were alpha-chlordane, gamma-chlordane, and 4,4,4'-DDE. Their presence at depth in these ponds could potentially be the result of soil mixing that occurred during pond dredging, which could intermittently expose subsurface soils. The compounds were not detected in the lime/alum sludge itself and, therefore, are unlikely to have resulted from leaching through the pond bottoms. Aroclor-1260 was detected at 59 µg/kg in one sample.

As with the surface soil samples collected at Site 6, low concentrations of the highly chlorinated, low-toxicity dioxin/furan congeners were detected in the samples collected during the 1996 investigation. Dioxins were not detected in the soil samples collected from beneath the fly ash (lime/alum sludge) ponds.

The concentrations of metals beneath the ponds in the black, silty, soil materials and in the surrounding natural soils were within the same general range and order of magnitude. Several metals were detected beneath the ponds at concentrations higher than detected in other soils. These metals include calcium,

TABLE 6-3

**SUBSURFACE SOIL ANALYTICAL RESULTS (>1 FOOT) – SITE 6
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA**

Analyte	Concentration Range	Frequency of Detection	Average Background Concentration[1]
Volatile Organics (µg/kg)			
Acetone	705	1/9	79.7
2-Butanone	15	1/9	5[2]
Carbon disulfide	16.5	1/9	ND[3]
Chloroform	5	1/9	5[2]
Semivolatile Organics (µg/kg)			
Bis(2-ethylhexyl)phthalate	66 – 670	3/9	75[2]
Di-n-butylphthalate	240 – 720	4/9	218
Pesticides/PCBs/Dioxins/Furans (µg/kg)			
alpha-Chlordane	0.16 – 0.23	2/9	1.09
gamma-Chlordane	0.34 – 0.50	2/9	1.02
4,4'-DDE	1.0	1/9	0.625[2]
Aroclor-1260	59	1/9	ND
1,2,3,6,7,8-HxCDD	0.0015	1/6	NA[4]
1,2,3,6,7,8-HpCDF	0.0044	1/6	NA
OCDD	0.1226	1/6	NA
OCDF	0.0038 – 0.0062	2/6	NA
Total HxCDD	0.0015	1/6	NA
Total HpCDF	0.0044	1/6	NA
Inorganics (mg/kg)			
Aluminum	861 – 15,900	14/14	5,080
Antimony	14.6	1/11	ND
Arsenic	0.58 – 25.5	13/14	1.95
Barium	6.8 – 1,066	13/14	11.5
Beryllium	0.24 – 3.0	9/14	0.221
Calcium	265 – 36,000	6/14	256
Chromium	8.6 – 24.8	11/14	8.48
Cobalt	6.7 – 11.05	3/14	1.19
Copper	1.7 – 58.5	11/14	1.88
Iron	591 – 22,200	13/14	2,980
Lead	2.0 – 13.55	11/14	5.26
Magnesium	125 – 3,955	8/14	211
Manganese	2.9 – 133.5	10/14	8.36
Mercury	0.06 – 0.25	7/14	0.064
Nickel	2.3 – 34.1	6/14	3.45
Potassium	61.7 – 1,050	8/14	241
Selenium	0.36 – 6.6	5/14	0.28
Sodium	311	1/14	25.5
Thallium	0.28 – 0.79	3/14	0.48[2]
Vanadium	7.2 – 141.5	13/14	9.58
Zinc	8.2 – 15.65	3/14	5.66

1 The values presented are the average of all of the results reported for this compound calculated using one-half the detection limit for non-detects.
2 The average exceeded the maximum detection; therefore, maximum is reported.
3 ND – Not detected.
4 NA – Not analyzed.

potassium, and selenium. Calcium is one of the major components of the lime/alum sludge. The presence of selenium in these samples at concentrations higher than elsewhere in the study area does not appear to be related to either the fly ash disposal or the sludge. No source can be identified.

6.1.2.2 Site 7

A total of 30 subsurface soil locations were sampled during four field investigations. These include two samples collected during the RFI from the suspected disposal area, three samples collected during the TDM, 14 samples and 2 duplicate samples collected during the RI, and 11 samples and 3 duplicates collected during the 1995 supplemental pre-design investigation. ***Table 6-4*** summarizes the subsurface soil sampling results for Site 7.

On the south side of Luke Rowe's Gut, the soils are distinctly different in contamination profiles. A number of organic and inorganic analytes were detected at concentrations above background. A soil boring located on the eastern edge of the identified disposal area contained the highest concentrations of several VOCs and SVOCs detected in the soils at Site 7. The VOCs include benzene (6,600 µg/kg), ethylbenzene (61,000 µg/kg), and xylenes (63,000 µg/kg). This sample also contained 2-methylnaphthalene (77,000 µg/kg) and naphthalene (38,000 µg/kg). These compounds are relatively soluble PAHs that are found in various fuels. The sample was collected just above the water table, and the results appear to indicate that a small spill of gasoline or other fuels may have occurred in this area. The sample was noted to have a petroleum odor, and water collected from the soil boring during the ecological assessment indicated the presence of a fuel sheen. It is likely that during the use of the site as an incinerator and burning area, gasoline or other fuels may have been used to start a fire. This sampling location is approximately 50 feet from Luke Rowe's Gut, and the surface water samples collected in that vicinity do not contain fuel components, nor was a sheen noted on the water surface. Therefore, it may be concluded that detection of fuel-related compounds is an isolated occurrence.

The only VOCs identified in more than two of the samples were benzene (six samples at a maximum concentration of 6,660 µg/kg), acetone (four samples at a maximum concentration of 1,300 µg/kg), and methylene chloride (four samples at a maximum concentration of 7,500 µg/kg).

PAHs were the most prevalent soil contaminants and were detected in up to half of the subsurface soil samples. Concentrations ranged from 23 µg/kg to 77,000 µg/kg (2-methylnaphthalene). The maximum concentrations of most PAHs were found in one boring in the 0- to 2-foot depth interval. This sample is located in the southeastern portion of the fly ash disposal area.

Several pesticides were also detected in the subsurface soil at Site 7. The most prevalent pesticides detected were 4,4'-DDD (1.8 to 200 µg/kg) and 4,4'-DDE (1.4 to 47 µg/kg). Both of these pesticides

TABLE 6-4

**SUBSURFACE SOIL ANALYTICAL RESULTS (>1 FOOT) – SITE 7
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2**

Analyte	Concentration Range	Frequency of Detection	Average Background Concentration[1]
Volatile Organics (µg/kg)			
Acetone	40 – 1,300	4/25	79.7
Benzene	2 – 6,600	6/25	ND[2]
2-Butanone	7	1/25	5[3]
Carbon disulfide	4.5	1/25	ND
Chloroform	2	1/25	5[3]
1,2-Dichloroethene	7	1/25	ND
Ethylbenzene	980 – 61,000	2/25	4[3]
Methylene chloride	68 – 7,500	4/25	4[3]
Tetrachloroethene	3	2/25	ND
Toluene	5	1/25	5.5
Trichloroethene	3 – 5	2/25	ND
Vinyl chloride	3.5 – 65	2/25	ND
Xylenes (total)	63,000	1/25	5.98
Semivolatile Organics (µg/kg)			
Acenaphthene	25 – 8,300	5/25	ND
Acenaphthylene	97	1/25	ND
Anthracene	26 – 14,000	8/25	ND
Benzo(a)anthracene	45 – 16,000	12/25	ND
Benzo(a)pyrene	61 – 12,000	12/25	ND
Benzo(b)fluoranthene	23 – 10,000	8/25	ND
Benzo(g,h,i)perylene	48 – 2,800	8/25	ND
Benzo(k)fluoranthene	56 – 11,000	13/25	ND
Bis(2-ethylhexyl)phthalate	280 – 5,650	2/25	75[3]
Butylbenzylphthalate	84	1/25	ND
Carbazole	53 – 19,000	6/25	ND
4-Chloroaniline	159	1/25	ND
Chrysene	67 – 14,000	12/25	ND
Dibenz(a,h)anthracene	59 – 1,400	6/25	ND
Dibenzofuran	26 – 5,700	5/25	ND
Di-n-butylphthalate	140 – 660	10/25	218
1,4-Dichlorobenzene	27 – 99	4/25	ND
3,3'-Dichlorobenzidine	460	1/25	ND
2,4-Dimethylphenol	69	1/25	ND
2,4-Dinitrotoluene	210	1/25	ND
Fluoranthene	65 – 35,000	14/25	ND
Fluorene	24 – 9,200	7/25	ND
Hexachlorocyclopentadiene	430	1/25	ND
Indeno(1,2,3-cd)pyrene	39 – 2,900	12/25	ND
2-Methylnaphthalene	25 – 77,000	11/25	ND
4-Methylphenol	21	1/25	ND
Naphthalene	47 – 38,000	8/25	ND
N-Nitrosodiphenylamine	150	1/25	ND
Phenanthrene	43 – 41,000	14/25	ND
Phenol	48 – 52	2/25	ND
Pyrene	57 – 28,000	14/25	ND

TABLE 6-4

**SUBSURFACE SOIL ANALYTICAL RESULTS (>1 FOOT) – SITE 7
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 2**

Analyte	Concentration Range	Frequency of Detection	Average Background Concentration[1]
Pesticides/PCBs/Dioxins/Furans (µg/kg)			
gamma-Chlordane	3.4 – 15	3/9	1.02
4,4'-DDD	1.8 – 200	4/8	2.0
4,4'-DDE	1.4 – 47	4/9	0.625[3]
4,4'-DDT	19 – 22	2/8	0.56[3]
Dieldrin	14 – 24	2/9	1.10[3]
Endrin	9.2	1/9	ND
Endrin aldehyde	11 – 15.45	2/8	ND
Heptachlor epoxide	2.1	1/8	ND
Methoxychlor	62	1/9	0.29[3]
OCDD	3.69	1/8	NA[4]
Inorganics (mg/kg)			
Aluminum	2,270 – 17,800	28/28	5,080
Antimony	0.66 – 224.15	25/30	ND
Arsenic	0.43 – 48.2	30/30	1.95
Barium	6.4 – 770	30/30	11.5
Beryllium	0.28 – 1.5	13/30	0.221
Cadmium	1.5 – 95.3	23/30	0.564
Calcium	363 – 31,000	28/28	256
Chromium	4.4 – 615	30/30	8.48
Cobalt	0.41 – 30.5	25/30	1.19
Copper	1.3 – 8,490	28/30	1.88
Cyanide	0.23 – 3.2	17/23	0.308
Iron	1,760 – 228,000	28/28	2,980
Lead	2.5 – 15,900	29/30	5.26
Magnesium	122 – 3,850	28/28	211
Manganese	4.0 – 1,770	28/28	8.36
Mercury	0.07 – 88.1	24/28	0.064
Nickel	1.9 – 326	23/30	3.45
Potassium	128 – 1,310	22/28	241
Selenium	0.22 – 5.5	18/30	0.28
Silver	0.76 – 66.4	22/29	0.405
Sodium	28.2 – 1,025	20/28	25.5
Thallium	0.28 – 17.5	3/30	0.48[3]
Vanadium	5.1 – 35.7	29/29	9.58
Zinc	1.9 – 4,920	28/30	5.66

1 The values presented are the average of all of the results reported for this compound using one-half the detection limit for non-detects.
2 ND – Not detected.
3 The average exceeded the maximum detection; therefore, maximum is reported.
4 NA – Not analyzed.

were detected in four subsurface soil samples. Other pesticides that were detected in three or fewer samples included gamma-chlordane (3.4 to 15 µg/kg), 4,4'-DDT (19 to 22 µg/kg), dieldrin (14 to 24 µg/kg), endrin (9.2 µg/kg), endrin aldehyde (11 to 15.45 µg/kg), heptachlor epoxide (2.1 µg/kg), and methoxychlor (62 µg/kg). The only congener of dioxin detected in the subsurface soil at Site 7 was OCDD (3.69 µg/kg).

The concentrations of many metals in the subsurface soil at Site 7 were similar to those detected in the surface soils. Some metals were detected at higher concentrations in the surface than in the subsurface (barium, copper, and vanadium), while other metals (antimony, arsenic, beryllium, chromium, mercury, and silver) exhibited the opposite trend. In general, all maximum concentrations (surface or subsurface) were within the same order of magnitude, and were often within 10 to 30 percent of each other. Other metals, some of which include antimony, arsenic, chromium, cadmium, cobalt, lead, manganese, mercury, nickel, and zinc, were also detected in multiple subsurface soil samples at concentrations greater than reported background concentrations.

6.2 GROUNDWATER

6.2.1 Surficial Aquifer

Sites 6 and 7 are discussed separately because they are separated by a hydrogeologic divide (Luke Rowe's Gut).

6.2.1.1 Site 6

Table 6-5 summarizes the most recent surficial aquifer groundwater sampling results. No VOCs or SVOCs were detected. One well was found to have low concentrations (less than 0.1 µg/L) of several pesticides. The concentrations of 4,4'-DDT and dieldrin exceeded state groundwater standards.

The concentrations of iron and manganese also exceeded state groundwater standards in most of the wells. Copper and selenium were detected in several wells at concentrations below the state groundwater standards, but were not detected in background samples. Many concentrations of calcium, magnesium, potassium, and sodium also exceeded background concentrations.

6.2.1.2 Site 7

Table 6-6 summarizes the most recent surficial aquifer groundwater sampling results. The most commonly detected organic contaminants in the surficial aquifer at Site 7 were benzene, bis(2-ethylhexyl)phthalate, and 2-methylnaphthalene. Most of the results for these analytes exceeded

TABLE 6-5

SURFICIAL AQUIFER GROUNDWATER ANALYTICAL RESULTS SITE 6 – 1994/1995
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections	Background Range	NC Class GA Standard[1]
Pesticides (µg/L)					
gamma-BHC (Lindane)	1/8	0.017	0.017	NA[2]	0.2
gamma-Chlordane	1/8	0.0085	0.0085	NA	0.027
4,4'-DDT*[3]	1/8	0.043	0.043	NA	>DL[4]
Dieldrin*	1/8	0.071	0.071	NA	>DL
Endrin	1/8	0.087	0.087	NA	2
Inorganics (µg/L)					
Aluminum	5/8	251	44.0 - 409	ND[5] – 2,500	NS[6]
Arsenic	3/8	5.9	4.3 – 8.0	ND – 3.3	50
Barium	8/8	48.6	12.0 - 110	3.9 – 43.7	2,000
Calcium	8/8	19,500	3,320 – 78,700	ND – 2,305	NS
Chromium	1/8	10.0	10.0	ND – 9.7	50
Copper	4/8	2.5	2.0 – 3.0	ND	1,000
Iron*	8/8	1,810	280 – 4,930	ND – 4,370	300
Magnesium	8/8	4,920	2,070 – 15,800	709 – 2,295	NS
Manganese*	8/8	36.0	10.0 - 101	5.3 – 35.8	50
Potassium	8/8	4,570	1,120 – 10,400	ND – 1,315	NS
Selenium	1/8	2.6	2.6	ND	50
Sodium	8/8	13,700	4,780 – 25,000	2,130 – 7,560	NS
Zinc	4/8	9.5	6.0 – 16.0	ND – 14.0	2,100

1 15A NCAC 2L.0200.
2 NA – Not analyzed.
3 Asterisk next to analyte indicates exceedance of state standard.
4 >DL – Greater than detection limit. Any detection is considered an exceedance of the standard.
5 ND – Not detected.
6 NS – No standard.

TABLE 6-6

SURFICIAL AQUIFER GROUNDWATER ANALYTICAL RESULTS – SITE 7 - 1994/1995
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections	Background Range	NC Class GA Standard[1]
Volatile Organics (µg/L)					
Acetone	2/5	29	3 - 55	NA[2]	700
Benzene*[3]	6/16	31.3	1 - 120	NA	1
Carbon disulfide	1/16	0.7	0.7	NA	700
Chlorobenzene	1/16	2	2	NA	50
cis-1,2-Dichloroethene	2/16	1	1	NA	70
1,2-Dichlorobenzene	1/16	3	3	NA	620
1,1-Dichloroethane	1/16	1	1	NA	700
Methylene chloride	1/16	1	1	NA	5
trans-1,2-Dichloroethene	1/16	2	2	NA	70
Trichloroethene	1/16	1	1	NA	2.8
Vinyl chloride*	1/16	6	6	NA	0.015
Xylenes (total)	2/16	0.5	0.4 – 0.6	NA	530
Semivolatile Organics (µg/L)					
Acenaphthene	1/15	1	1	NA	80
Bis(2-ethylhexyl)phthalate*	5/15	24.9	0.7 - 62	NA	3
2-Methylnaphthalene*	3/15	9.7	5 - 18	NA	>DL[3]
Naphthalene	1/15	3	3	NA	21
Pentachlorophenol*	1/15	1	1	NA	0.3
Pyrene	1/15	0.6	0.6	NA	210
Pesticides (µg/L)					
4,4'-DDT*	1/8	0.0052	0.0052	NA	>DL
Endosulfan I*	1/8	0.01	0.01	NA	>DL
Inorganics (µg/L)					
Aluminum	8/16	865	13.0 – 4,440	ND[5] – 2,500	NS[6]
Antimony	4/16	7.45	3.2 – 14.7	ND	NS
Arsenic	1/16	19.8	19.8	ND – 3.3	50
Barium*	16/16	661	12.0 – 2,520	3.9 – 43.7	2,000
Cadmium*	3/16	4.6	2.3 – 6.5	ND	5
Calcium	16/16	89,225	17,400 – 227,000	ND – 2,305	NS
Chromium	4/16	4.9	1.4 – 10.3	ND – 9.7	50
Cobalt	7/16	3.4	1.1 – 12.5	ND	NS
Copper	3/16	62.5	2.3 - 179	ND	1,000
Iron*	15/16	8,890	171 – 41,600	ND – 4,370	300
Lead*	10/16	29.3	1.0 - 228	ND – 5.0	15
Magnesium	16/16	21,100	1,840 – 85,200	709 – 22,295	NS
Manganese*	16/16	174	51.0 - 611	5.3 – 35.8	50
Nickel	5/16	8.6	1.2 – 31.5	ND	100
Potassium	13/16	14,100	1,040 – 52,100	ND – 1,315	NS
Selenium	1/16	1.3	1.3	ND	50
Silver	1/16	7.0	7.0	ND	18

TABLE 6-6

SURFICIAL AQUIFER GROUNDWATER ANALYTICAL RESULTS – SITE 7 - 1994/1995
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 2

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections	Background Range	NC Class GA Standard[1]
Sodium	16/16	49,500	6,000 – 342,000	2,130 – 7,560	NS
Vanadium	2/16	5.1	1.2 – 9.0	ND	NS
Zinc	10/16	84.3	6.1 - 535	ND – 14.0	2,100
Cyanide	1/16	12	12	NA	154

1 15A NCAC 2L.0200.
2 NA – Not analyzed.
3 Asterisk next to analyte indicates exceedance of state standard.
4 >DL – Greater than detection limit. Any detection is considered an exceedance of the standard.
5 ND – Not detected.
6 NS – No standard.

state groundwater standards. Vinyl chloride, pentachlorophenol, 4,4'-DDT, and endosulfan I were each detected in one sample at concentrations higher that the state standards.

Inorganics detected at concentrations higher than state groundwater standards include barium, cadmium, iron, lead, and manganese. Arsenic, chromium, copper, nickel, selenium, silver, and zinc were detected at concentrations lower than the state groundwater standards. Inorganics detected that have no state groundwater standard and were not detected in background samples include antimony, cobalt, and vanadium. Many concentrations of calcium, magnesium, potassium, and sodium also exceeded background concentrations.

6.2.2 Yorktown Aquifer

Table 6-7 summarizes the Yorktown aquifer groundwater sampling results. Only one well at OU3 has been installed in the Yorktown aquifer. No organic compounds were detected in this well. The only metals detected were barium, calcium, magnesium, manganese, potassium, and sodium. None of the concentrations exceeded state groundwater standards.

6.3 SURFACE WATER

6.3.1 Luke Rowe's Gut

Table 6-8 summarizes the most recent surface water sampling results for Luke Rowe's Gut. The upstream location contained the only detections of phthalate esters and the highest concentrations of aluminum, iron, and zinc. The results for the downstream sample contained the highest concentrations of calcium, magnesium, manganese, mercury, potassium, and sodium, which in all cases were similar to the concentrations reported for Slocum Creek. This sampling location is located in the mouth of Turkey Gut, near where it flows into Slocum Creek. The concentrations of bis(2-ethylhexyl)phthalate, aluminum, calcium, copper, magnesium, manganese, mercury, potassium, and sodium exceeded the state Class C surface water standards/criteria in one or more samples. The state standards/criteria have been revised since the RI report was published. The revised values are reported in ***Table 6-8.***

6.3.2 Slocum Creek

Table 6-9 summarizes the most recent surface water sampling results for Slocum Creek. Chloroform was the only organic compound detected. In general, chemical concentrations do not vary significantly between upstream and downstream areas, and the concentrations of most metals are similar between the unfiltered and filtered samples. The high calcium, magnesium, potassium, and sodium concentrations are indicative of the brackish nature of Slocum Creek. The concentrations of chromium, copper, manganese, mercury, and nickel exceeded the state Class SC surface water standards/criteria in one or

TABLE 6-7

YORKTOWN AQUIFER GROUNDWATER RESULTS
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	Positive results (µg/L)	NC Class GA Standard (µg/L)[1]
Barium	7.0	2,000
Calcium	58,800	NS[2]
Magnesium	1,440	NS
Manganese	15.0	50
Potassium	2,290	NS
Sodium	9,310	NS

1 15A NCAC 2L.0200.
2 NS – No standard.

TABLE 6-8

LUKE ROWE'S GUT SURFACE WATER ANALYTICAL RESULTS – 1994
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	Frequency of Detection	Average of Positive Results	Range of Positive Detections	NC Class C Standard/Criteria[1]
Volatile Organics (µg/L)				
Bromodichloromethane	2/3	3.25	2.5 - 4	22
Chloroform	3/3	14.2	2 - 22	470
Semivolatile Organics (µg/L)				
Bis(2-ethylhexyl)phthalate*[2]	1/3	18	18	5.9
Di-n-butylphthalate	1/3	3	3	12,000
Inorganics (µg/L)				
Aluminum*	2/3	299	184 - 413	87
Barium	3/3	29.8	17.5 – 39.0	1,400
Calcium*	3/3	93,300	26,850 – 132,000	7,300
Iron	3/3	431	193 - 736	1,000
Lead	2/3	3.45	3.3 – 3.6	25
Magnesium*	3/3	222,000	2,575 – 355,000	200
Manganese*	3/3	158	29.5 - 280	100
Mercury*	1/3	0.21	0.21	0.012
Potassium*	3/3	68,800	2,765 – 110,000	30,000
Sodium*	3/3	172,000	10,500 – 2,810,000	400,000
Zinc	2/3	9.38	8.0 – 10.75	50
Inorganics – Filtered (µg/L)				
Aluminum	1/3	53.0	53.0	87
Antimony	1/3	8.3	8.3	4,300
Barium	3/3	25.3	17.0 – 31.0	1,400
Calcium*	3/3	73,900	27,000 – 131,000	7,300
Copper*	2/3	11.6	7.25 – 16.0	7
Iron	1/3	128	128	1,000
Lead	2/3	2.15	1.5 – 2.8	25
Magnesium*	3/3	160,000	2,625 – 369,000	200
Manganese*	3/3	81.5	28.0 - 187	100
Potassium*	3/3	50,900	2,875 – 113,000	30,000
Sodium*	3/3	957,000	9,120 – 2,850,000	400,000

1 NCDENR, 1997.
2 Asterisk next to analyte indicates exceedance of standard/criteria.

TABLE 6-9

SLOCUM CREEK SURFACE WATER ANALYTICAL RESULTS – 1994
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	Frequency of Detection	Average of Positive Detection	Range of Positive Detections	NC Class SC Standard/Criteria[1]
Volatile Organics (µg/L)				
Chloroform	3/4	1.67	1 - 2	470
Inorganics (µg/L)				
Barium	4/4	31.3	30.0 – 35.0	1,400
Calcium	4/4	132,000	130,000 – 133,000	NS[2]
Lead	4/4	5.83	1.9 – 10.4	25
Magnesium	4/4	356,000	350,000 – 360,000	NS
Manganese*[3]	4/4	209	174 - 292	100
Mercury*	1/4	0.45	0.45	0.025
Potassium	4/4	112,000	109,000 – 114,000	NS
Selenium	1/4	5.0	5.0	71
Sodium	4/4	2,780,000	2,710,000 – 2,810,000	NS
Zinc	4/4	8.0	7.0 – 9.0	86
Inorganics – Filtered (µg/L)				
Barium	4/4	29.0	28.0 – 32.0	1,400
Calcium	4/4	132,000	131,000 – 134,000	NS
Chromium*	2/4	22.5	11.0 – 34.0	20
Copper*	4/4	27.0	24.0 – 29.0	3
Lead	2/4	7.95	6.3 – 9.6	25
Magnesium	4/4	375,000	369,000 – 386,000	NS
Manganese	2/4	5.0	4.0 – 6.0	100
Nickel*	1/4	38.0	38.0	8.3
Potassium	4/4	114,500	111,000 – 116,000	NS
Sodium	4/4	2,321,500	296,000 – 3,030,000	NS

1 NCDENR, 1997.
2 NS – No standard/criteria
3 Asterisk next to analyte indicates exceedance of standard/criteria.

more samples. The state standards/criteria have been revised since the RI report was published. The revised values are reported in ***Table 6-9.***

6.4 SEDIMENT

6.4.1 Luke Rowe's Gut

Table 6-10 summarizes sediment sampling results for Luke Rowe's Gut. Three locations within the gut are considered upstream of a potential site-related groundwater discharge or surface water runoff from the identified areas of concern. Several pesticides, such as aldrin, beta-BHC, chlordane, 4,4'-DDD, 4,4'-DDE, dieldrin, and endrin, were detected in single samples. The highest detected concentrations were 16 µg/kg (beta-BHC) and 2.65 µg/kg (4,4'-DDD). All other concentrations of pesticides in these areas were below 1 µg/kg

The downstream samples that are located within a zone potentially affected by the study area contained only a few VOCs and pesticides, and at relatively low concentrations. Some, but not all, of the pesticides were detected in surface soil samples. It is not known whether the site is contributing to the presence of pesticides, or whether the presence is a result of current or past use of pesticides at the Air Station. Metals that were detected at high concentrations in the onsite soil were not detected at elevated concentrations in the sediment samples collected along the disposal area.

6.4.2 Slocum Creek

Table 6-11 summarizes sediment sampling results for Slocum Creek. Site-related compounds, such as PAHs, dioxins, chromium, copper, lead, and zinc, were not generally found at elevated concentrations in Slocum Creek. Some analytes (copper, mercury, and zinc) were found at the highest concentrations in the upstream sample. Other analytes (aluminum, arsenic, barium, beryllium, calcium, iron, magnesium, manganese, potassium, selenium, sodium, vanadium, alpha-chlordane, 4,4'-DDD, 4,4'-DDE, and dieldrin) were found at the highest concentrations in the downstream sample. There is no general pattern or trend in contaminant distribution in Slocum Creek.

Most of the metals were detected at concentrations similar to those measured in the background soil samples. Although this comparison is not totally valid (i.e., soils are not the same as sediments), the comparison still has credence in identifying whether onsite soils may be contributing to the observed sediment contamination.

TABLE 6-10

**LUKE ROWE'S GUT SEDIMENT ANALYTICAL RESULTS
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA**

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections
Volatile Organics (µg/kg)			
Acetone	3/6	18.7	11 - 25
Bromodichloromethane	1/12	5	5
Carbon tetrachloride	1/12	5	5
Methylene chloride	1/12	7	7
Toluene	1/12	38	38
Semivolatile Organics (µg/kg)			
Bis(2-ethlhexyl)phthalate	1/9	320	320
Di-n-butylphthalate	1/9	650	650
Pesticides/PCBs (µgkg)			
Aldrin	2/9	0.32	0.28 – 0.36
alpha-Chlordane	1/3	0.565	0.565
beta-BHC	1/9	16	16
4,4'-DDD	3/9	1.84	0.87 – 2.65
4,4'-DDE	3/9	0.347	0.19 – 0.48
4,4'-DDT	1/9	0.27	0.27
delta-BHC	1/9	1.2	1.2
Dieldrin	1/9	0.17	0.17
Endosulfan sulfate	1/9	0.39	0.39
Endrin	2/9	0.345	0.16 – 0.53
gamma-Chlordane	1/1	0.635	0.635
Heptachlor	1/9	0.081	0.081
Heptaclor epoxide	2/9	0.135	0.13 – 0.14
Inorganics (mg/kg)			
Aluminum	3/3	2,530	444 – 6,690
Antimony	2/12	15	10 - 20
Arsenic	8/12	0.718	0.30 – 1.9
Barium	6/6	15.1	1.8 – 39.7
Beryllium	2/12	0.675	0.60 – 0.75
Cadmium	5/12	0.972	0.5 – 1.4
Calcium	3/3	85,900	2,030 – 250,500
Chromium (total)	10/12	5.78	1 – 14.5
Chromium VI	1/6	6	6
Cobalt	3/6	1.41	0.63 – 2.93
Copper	11/12	4.54	1.4 - 18
Iron	3/3	1,480	596 – 3,180
Lead	11/12	20.1	4.1 - 48
Magnesium	3/3	702	163 – 1,700
Manganese	3/3	151	14.8 - 388
Mercury	2/9	0.2	0.2
Nickel	2/12	3	3
Potassium	2/3	72.9	57.6 – 88.3
Sodium	3/3	596	186 - 817
Vanadium	4/6	4.33	2.6 – 8.4
Zinc	11/12	19.7	4 – 54

TABLE 6-11

**SLOCUM CREEK SEDIMENT ANALYTICAL RESULTS
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA**

Analyte	Frequency of Detection	Average of Positive Detections	Range of Positive Detections
Semivolatile Organic (µg/kg)			
Di-n-butylphahalate	3/4	223	190 – 260
Fluoranthene	1/4	91	91
Phenol	1/4	120	120
Pesticides/PCBs (µg/kg)			
alpha-Chlordane	1/4	1.5	1.5
4,4'-DDD	2/4	3.39	0.97 – 5.8
4,4'-DDE	2/4	0.81	0.12 – 1.5
Dieldrin	1/4	1.2	1.2
Endrin aldehyde	1/4	0.74	0.74
Heptachlor epoxide	1/4	0.20	0.20
Inorganics (mg/kg)			
Aluminum	4/4	2,450	739 – 3,980
Arsenic	3/4	1.58	0.55 – 3.2
Barium	4/4	57.0	2.3 – 187
Beryllium	1/4	0.94	0.94
Calcium	4/4	5,250	1,370 – 13,700
Chromium (total)	4/4	15.1	8.1 – 21.6
Copper	4/4	10.8	2.3 – 16.4
Iron	4/4	3,370	1,010 – 6,700
Lead	4/4	14.5	4.3 – 23.6
Magnesium	4/4	817	488 – 1,480
Manganese	4/4	194	28.9 – 344
Mercury	4/4	2.01	0.27 – 4.3
Nickel	1/4	11.0	11.0
Potassium	4/4	347	109 – 940
Selenium	1/4	0.89	0.89
Sodium	4/4	2,630	1,510 – 5,200
Vanadium	1/4	11.8	11.8
Zinc	4/4	37.0	11.0 – 65.9

6.5 LIME/ALUM SLUDGE

One composite sample of the lime/alum sludge in the ponds at Site 6 was collected during the 1994 RI and analyzed for the full Target Compound List (TCL) and Target Analyte List (TAL). The positive results are summarized in ***Table 6-12***. As expected, this material did not contain many of the analytes. Di-n-butylphthalate, which is a polymer addition for the treatment of raw water at the water treatment plant, was detected at a concentration of 780 µg/kg. No other organic compounds were detected. The concentrations of arsenic, chromium, copper, and vanadium are similar to those reported in background soil samples. The concentrations of aluminum, calcium, and magnesium are much higher. These results are typical for this type of sludge. Little contamination was identified in this material. For instance, the only metals detected in the lime/alum sludge and in subsurface soil from the fly ash disposal area were arsenic, chromium, copper, and manganese. The maximum detected concentrations are as follows:

Metal	Lime/Alum Sludge (mg/kg)	Fly Ash (mg/kg)
Arsenic	2.9	48.2
Chromium	11.2	615
Copper	10.4	8,490
Manganese	123	1,770

TABLE 6-12

**LIME/ALUM SLUDGE ANALYTICAL RESULTS
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA**

Analyte	Concentration
Semivolatile Organics (µg/kg)	
Di-n-butylphthalate	780
Inorganics (mg/kg)	
Aluminum	12,000
Arsenic	2.9
Barium	92.8
Calcium	309,000
Chromium (total)	11.2
Copper	10.4
Iron	5,340
Magnesium	4,530
Manganese	123
Potassium	440
Vanadium	14.5

7.0 CONTAMINANT FATE AND TRANSPORT

The most prevalent contaminants at OU3 are PAHs and metals in soils, and benzene, bis(2-ethylhexyl)phthalate, 2-methylnaphthalene, and metals in groundwater. In addition, low concentrations of a few other VOCs were detected in one temporary well, whereas low concentrations of some pesticides were detected in two wells. Pesticides were also detected in the sediment.

PAHs are generally considered to be fairly immobile chemicals in the environment. They are large molecules with high organic carbon partition coefficients and low solubilities when compared to the VOCs. These compounds, when found in the surface soil, generally do not migrate vertically to a great extent. Instead, they are more likely to adhere to soil particles and be removed from the site via surface runoff and erosional processes. At OU3, the ground surface is fairly flat and well vegetated, and the PAHs detected in the surface soil do not appear to have migrated off site to the sediments, although fluoranthene was detected in one sediment sample in Slocum Creek.

Several PAHs (benzo(k)fluoranthene, fluoranthene, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene) were detected in subsurface soils. The highest concentrations, however, were generally detected in soil samples collected from a depth of 0 to 2 feet. Three of the most soluble PAHs (2-methylnaphthalene, naphthalene, and phenanthrene) were detected at the highest concentrations (up to 77,000 µg/kg), whereas other PAHs were detected at somewhat lower concentrations. The highest concentrations were found in a soil sample associated with high benzene, ethylbenzene, and xylenes concentrations, as well. These results may indicate a small fuel release or a fire (open burning) started with gasoline or other fuel.

2-Methylnaphthalene (18 µg/L), acenaphthene (1 µg/L), naphthalene (3 µg/L), and pyrene (0.6 µg/L) were the only PAHs detected in the groundwater samples. Because 2-methylnaphthalene is one of the more soluble PAHs and may be associated with benzene, its presence may also be related to another small fuel release or open burning.

Because metals are frequently incorporated into the soil matrix and remain bound to particulate matter, they also migrate from the source areas via bulk movement processes (erosion). The larger particles (> 0.45 microns, which are not removed via the filtration step prior to water analysis) are not generally considered to be mobile in groundwater. The metals detected in early unfiltered groundwater samples are likely to be representative of suspended soil material in the samples. Groundwater samples collected since 1994 were collected using a low-flow-purge and sample technique that eliminates the need for filtering of groundwater samples. Consequently, all recent groundwater samples have been unfiltered.

In some instances, however, these metals were found at such concentrations or in such form as to be able to migrate in solution. It is possible that industrial activities could saturate all available exchange sites in soil, and hence a metal may be mobilized. Metals are also more mobile under acidic conditions, which may exist in areas where certain industrial activities have occurred. Finally, a metal solution may be used in some industrial applications. In these cases, it is possible for metals to migrate vertically through the soil column and reach the groundwater, although such activities did not occur at OU3. However, at OU3, the concentrations of toxic metals were low (below drinking water standards) or not detected in groundwater even though high concentrations were noted in soil. Lead, copper, and zinc, in particular, were noted in multiple soil samples (from the former incinerator or fly ash disposal area) at concentrations above background, but were essentially not detected in groundwater when the low-flow sampling techniques were used.

VOCs are typically considered to be fairly soluble and have a low capacity for retention by soil organic carbon. Therefore, VOCs are the organic compounds most likely to be detected in groundwater. These types of chemicals may migrate through the soil column after being released by a spill event as infiltrating precipitation solubilizes them. Some portion of these chemicals is retained by the unsaturated soil, but most will continue migrating downward until they reach the water table.

Several of the VOCs have specific gravities less than that of water (e.g., benzene, xylenes). These compounds are typically found in fuels, and if a large enough fuel spill occurs (including open burning and using gasoline, etc., as a fuel), these compounds may move through the soil column as a bulk liquid until they reach the water table. There, instead of going into solution, most of the release may remain as a discrete fuel layer on the water table surface, with some of the material going into solution at the waterfuel interface. Although benzene was detected in six monitoring wells, no floating fuel product was observed in any permanent or temporary monitoring wells, even though water collected in one soil boring at Site 7 exhibited an oily sheen. This oily sheen indicates that fuel constituents are entering the groundwater. The water table over much of the study area is less than 5 feet deep, and only two soil samples contained notable concentrations of these fuel-related constituents, whereas several soil samples contained low concentrations of these compounds. A temporary well installed downgradient of the contaminated soil area contained 15 µg/L benzene, but no fuel sheens were observed in Luke Rowe's Gut in this general area.

Pesticides were widely used at the Air Station. Many of the compounds detected are no longer licensed for general sale and use in the United States. Therefore, it is assumed that much of what was detected in the soil and sediments is representative of past application for insect control. Pesticides as a class of compounds are not considered to be very mobile in the environment. These chemicals, upon application or disposal, tend to remain affixed to soil particles. Migration of pesticides occurs primarily by erosion via the wind or water. However, the flat terrain and thick vegetation at OU3 have minimized migration of pesticides. Concentrations of pesticides in soils and sediments at OU3 were generally below 10 µg/kg.

8.0 SUMMARY OF SITE RISKS

8.1 BASELINE HUMAN HEALTH RISK ASSESSMENT

The baseline risk assessment provides the basis for taking action and indicates the exposure pathways that need to be addressed by remedial action. It serves as the baseline for indicating what risks could exist if no action were taken at OU3. This section of the ROD reports the results of the baseline risk assessment conducted for OU3.

8.1.1 Chemicals of Potential Concern

A human health risk assessment was conducted for OU3 using the following USEPA risk assessment guidance and Region IV supplements:

- Risk Assessment Guidance, for Superfund (RAGS): Volume I, Human Health Evaluation Manual (Part A) (USEPA, 1989b).
- Exposure Factors Handbook (USEPA, 1989a).
- Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors (USEPA, 1991).
- Baseline Risk, Assessment Guidance (USEPA Region IV, 1991).
- Dermal Exposure Assessment: Principles and Applications, Interim Report (USEPA, 1992a).
- Supplement to RAGS: Calculating the Concentration Term (USEPA, 1992b).
- Supplement to RAGS: Region IV Bulletins (1 through 5) - Human Health Risk Assessment (USEPA Region IV, 1995).

The first step in the risk assessment was to develop a list of chemicals referred to as chemicals of potential concern (COPCs) for each medium sampled. Contaminant concentrations for those COPCs were then compared to risk-based screening concentrations, background concentrations, and groundwater and surface water standards. The risk-based concentrations were calculated to correspond

to an individual chemical incremental lifetime cancer risk (ILCR) of 1E-6 (1×10^{-6}, or a one-in-one-million risk) and a Hazard Index (HI) of 0.1 for specified, routine exposure. Residential exposure levels were used for soil and sediment. Risk-based concentrations for residential use of groundwater were used for screening groundwater and surface water contaminants.

Any COPC carried through the risk assessment process and that had an ILCR greater than 1E-6 or an HI greater than 0.1 for any of the exposure scenarios was considered to be a chemical of concern (COC). Contaminants with concentrations that exceeded a groundwater or surface water standard were also retained as COCs.

Essential elements may be screened out of a risk assessment if it is shown that concentrations detected are not associated with adverse health effects or do not exceed a groundwater or surface water standard. Therefore, the following nutrients were eliminated: calcium, magnesium, potassium, and sodium.

COPCs were developed for surface soil (less than 1 foot deep), all soils to a depth of 10 feet (the maximum assumed depth of intrusive activities [e.g., excavation, utility lines]), groundwater, surface water, and sediment. ***Table 8-1*** identifies the COPCs for OU3.

8.1.2 Exposure Assessment

Whether a chemical is actually a concern to human health depends on the likelihood of exposure (i.e., whether the exposure pathway is currently complete or could be complete in the future). A complete exposure pathway (a sequence of events leading to contact with a chemical) is defined by the following four elements:

- Source and mechanism of release.
- Transport medium (e.g., surface water, air) and mechanism of migration through the medium.
- Presence or potential presence of a receptor at the exposure point.
- Route of exposure (ingestion, inhalation, dermal absorption).

If all four elements are present, the pathway is considered complete.

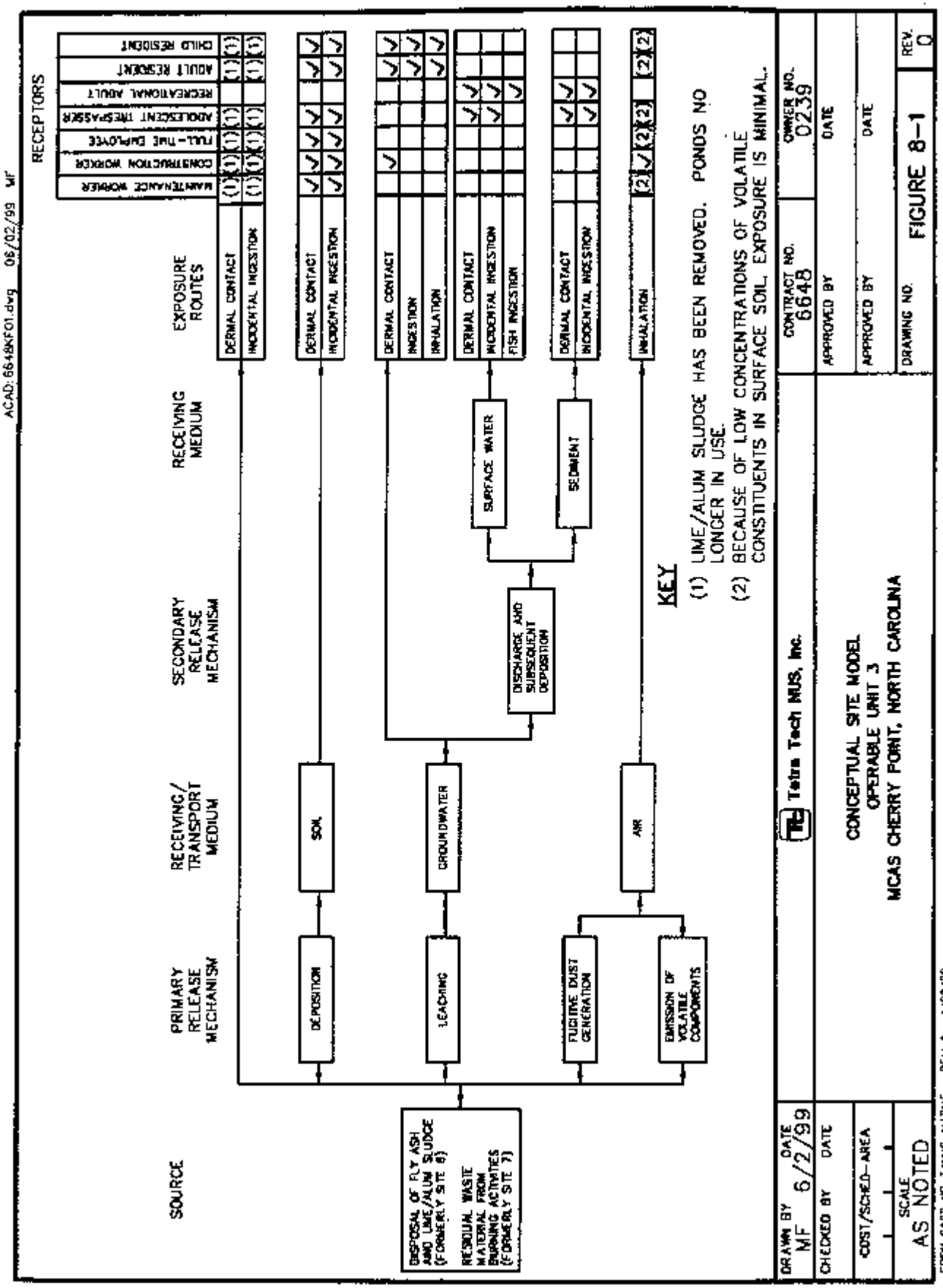
A conceptual site model was developed for OU3 to define potential receptors and the routes by which they are likely to be exposed. ***Figure 8-1*** represents the conceptual site model used to evaluate potential receptors for OU3. Identified receptors under current land use conditions included maintenance workers, trespassers, and recreational users of Slocum Creek. In addition, potential future land use conditions were also considered for residents, full-time employees, and construction workers. Maintenance workers

Table 8-1

MEDIA-SPECIFIC CHEMICALS OF POTENTIAL CONCERN (COPCs) BY SITE
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Surface Soil (0 to 1 Foot)[1]	All Soil (0 to 10 Feet)	Groundwater	Surface Water[2]	Sediment[2]
HpCDD/HpCDF (7) HxCDF (7) OCDD (7) Benzo(a)anthracene (7) Benzo(a)pyrene (7) Benzo(b)fluoranthene (7) Benzo(k)fluoranthene (7) Chrysene (7) Dibenz(a,h)anthracene (7) Indeno(1,2,3-cd)pyrene (7) Aroclors (7) Dieldrin (7) Aluminum (6, 7) Antimony (6, 7) Arsenic (6, 7) Barium (6, 7) Beryllium (6, 7) Cadmium (7) Chromium (7) Copper (7) Iron (6, 7) Lead (7) Manganese (7) Mercury (7) Nickel (7) Silver (7) Vanadium (6, 7) Zinc (7)	Benzo(a)anthracene (7) Benzo(a)pyrene (7) Benzo(b)fluoranthene (7) Benzo(k)fluoranthene (7) Chrysene (7) Dibenz(a,h)anthracene (7) Indeno(1,2,3-cd)pyrene (7) HxCDF (7) Antimony (7) Arsenic (6, 7) Beryllium (6, 7) Cadmium (7) Copper (7) Iron (7) Lead (7) Mercury (7) Thallium (7)	Benzene (7) cis-1,2-Dichloroethene (7) trans-1,2-Dichloroethene (7) Vinyl chloride (7) BEHP[3] (7) Pentachlorophenol (7) 2-Methylnaphthalene (7) Dieldrin (6) 4,4'-DDT (6, 7) Endosulfan I (7) Aluminum (7) Antimony (7) Arsenic (6, 7) Barium (7) Cadmium (7) Copper (7) Iron (6, 7) Lead (7) Manganese (6, 7)	Bromodichloromethane (L) Chloroform (L) BEHP (L) Chromium (S) Copper (L, S) Mercury (L, S) Nickel (S)	Antimony (L) Arsenic (L, S) Beryllium (L, S) Iron (L, S) Manganese (L, S) Mercury (S)

1 Data for 0-to-2 foot interval used for pesticides/PCBs/dioxins at Site 7.
2 L – Luke Rowe's Gut
S – Slocum Creek
3 Bis(2-ethylhexyl)phthalate


ACAD: 6648KF01.dwg 06/02/99 MF
RECEPTORS
MAINTENANCE WORKER
CONSTRUCTION WORKER
FULL-TIME EMPLOYEE
ADOLESCENT TRESPASSER
RECREATIONAL ADULT
ADULT RESIDENT
CHILD RESIDENT
EXPOSURE ROUTES
DERMAL CONTACT
INCIDENTAL INGESTION
DERMAL CONTACT
INCIDENTAL INGESTION
DERMAL CONTACT
INGESTION
INHALATION
DERMAL CONTACT
INCIDENTAL INGESTION
FISH INGESTION
DERMAL CONTACT
INCIDENTAL INGESTION
INHALATION
RECEIVING MEDIUM
SURFACE WATER
SEDIMENT
SECONDARY RELEASE MECHANISM
DISCHARGE AND SUBSEQUENT DEPOSITION
RECEIVING/ TRANSPORT MEDIUM
SOIL
GROUNDWATER
AIR
PRIMARY RELEASE MECHANISM
DEPOSITION
LEACHING
FUGITIVE DUST GENERATION
EMISSION OF VOLATILE COMPONENTS
SOURCE
DISPOSAL OF FLY ASH AND LIME/ALUM SLUDGE (FORMERLY SITE 6)
RESIDUAL WASTE MATERIAL FROM BURNING ACTIVITIES (FORMERLY SITE 7)
KEY
(1) LIME/ALUM SLUDGE HAS BEEN REMOVED. PONDS NO LONGER IN USE.
(2) BECAUSE OF LOW CONCENTRATIONS OF VOLATILE CONSTITUENTS IN SURFACE SOIL, EXPOSURE IS MINIMAL.
Tetra Tech NUS, Inc.
CONTRACT NO. 6648
OWNER NO. 0239
CONCEPTUAL SITE MODEL
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
APPROVED BY
DATE
APPROVED BY
DATE
DRAWN BY MF DATE 6/2/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED
DRAWING NO. FIGURE 8-1
REV. 0
FORM CADD NO. TtNUS_A4.DWG - REV 0 - 1/22/98

and full-time employees were assumed to be exposed only to surface soil via direct contact during routine onsite activities. Trespassers were assumed to come into direct contact with surface soil, surface water, and sediment. Recreational users were assumed to be exposed to surface water and sediment via direct contact. In addition, ingestion of fish was also considered. Under future land use conditions, construction workers represent potential receptors who could be exposed via direct contact with soils to a depth of perhaps 10 feet. Additional exposure routes considered for construction workers were direct contact with groundwater in the bottom of an excavation and inhalation of fugitive dust generated when the soil is disturbed. Future potential residents were assumed to be exposed to surface soil and groundwater via direct contact.

Two scenarios that were not considered to be applicable to OU3 are inhalation of volatile emissions or fugitive dust under current land use conditions. Volatile emissions were considered to be minimal, as only low concentrations of VOCs were detected in the surface soil. Fugitive dust was not considered because the site is currently well vegetated.

Exposure concentrations were based on a statistical development of the upper 95 percent confidence limit on the data set. In many instances, with isolated detections of high concentrations were among many lower concentrations, the Upper Confidence Level (UCL) exceeded the maximum detected concentrations. In these cases, the maximum detection was used as the exposure concentration. Because this was the case for many COPCs in most media at OU3, the risk assessment is considered to be extremely conservative. Exposure concentrations used to calculate human health risks are summarized in ***Table 8-2.*** Parameters used to estimate potential exposures for current and future land use receptors are summarized in ***Tables 8-3*** and ***8-4***, respectively.

8.1.3 Toxicity Assessment

A cancer slope factor (CSF) and a reference dose (RfD) were applied to estimate risk of cancer from an exposure and the potential for noncarcinogenic effects to occur from exposure.

CSFs have been developed by USEPAs Carcinogenic Assessment Group for estimating ILCRs associated with exposure to potentially carcinogenic COPCs. CSFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, were multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of risks calculated from the CSF. Use of this approach makes underestimations of the actual cancer risk highly unlikely. CSFs are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans).

TABLE 8-2

EXPOSURE CONCENTRATIONS FOR CHEMICALS OF POTENTIAL CONCERN (COPCs)[1]
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2

Chemical	Site 6			Site 7			Surface Water		Sediment	
	Surface Soil[2] (mg/kg)	All Soil[3] (mg/kg)	Groundwater (mg/L)	Surface Soil[2] (mg/kg)	All Soil[3] (mg/kg)	Groundwater (mg/L)	Luke Rowe's Gut (mg/L)	Slocum Creek (mg/L)	Luke Rowe's Gut (mg/kg)	Slocum Creek (mg/kg)
Benzene	-[4]	-	-	-	-	0.031	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	0.004[5]	-	-	-
Chloroform	-	-	-	-	-	-	0.022[5]	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	0.001	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	0.002	-	-	-	-
Vinyl chloride	-	-	-	-	-	0.006[5]	-	-	-	-
Benzo(a)anthracene	-	-	-	0.516	1.9	-	-	-	-	-
Benzo(a)pyrene	-	-	-	0.391	1.8	-	-	-	-	-
Benzo(b)fluoranthene	-	-	-	0.575	1.5	-	-	-	-	-
Benzo(k)fluoranthene	-	-	-	0.430	1.9	-	-	-	-	-
Chrysene	-	-	-	0.442	2.1	-	-	-	-	-
Dibenz(a,h)anthracene	-	-	-	0.24[5]	1.2	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	-	-	-	0.291	1.3	-	-	-	-	-
2-Methylnaphthalene	-	-	-	-		0.010	-	-	-	-
Bis(2-ethylhexyl) phthalate	-	-	-	-	-	0.025	0.018[5]	-	-	-
Pentachlorophenol	-	-	-	-	-	0.001[5]	-	-	-	-
Aroclors (all)	-	-	-	0.40[5]	-	-	-	-	-	-
Dieldrin	-	-	0.000071[5]	0.059[5]	-	-	-	-	-	-
Endosulfan I	-	-	-	-	-	0.00001	-	-	-	-
4,4'-DDT	-	-	0.000043[5]	-	-	5.2E-6	-	-	-	-
1,2,3,4,6,7,8-HpCDD	-	-	-	0.00487[5,7]	-	-	-	-	-	-

TABLE 8-2

EXPOSURE CONCENTRATIONS FOR CHEMICALS OF POTENTIAL CONCERN (COPCs)[1]
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 2

Chemical	Site 6			Site 7			Surface Water		Sediment	
	Surface Soil[2] (mg/kg)	All Soil[3] (mg/kg)	Groundwater (mg/L)	Surface Soil[2] (mg/kg)	All Soil[3] (mg/kg)	Groundwater (mg/L)	Luke Rowe's Gut (mg/L)	Slocum Creek (mg/L)	Luke Rowe's Gut (mg/kg)	Slocum Creek (mg/kg)
1,2,3,6,7,8-HxCDF	-	-	-	0.00119[5,8]	0.00037[8]	-	-	-	-	-
OCDD	-	-	-	0.01274[5]	-	-	-	-	-	-
Aluminum	9960[5]	-	-	15400	-	4.44	-	-	-	-
Antimony	15.5[5]	-	-	78.4	224	0.00745	0	0	20[5]	-
Arsenic	54.3[5]	47.9	0.008[5]	18.8	30.7	0.0198[5]	-	-	1.9[5]	3.2[5]
Barium	732[5]	-	-	557	-	0.661	-	-	-	-
Beryllium	2.3[5]	2.13	-	0.43	0.43	-	-	-	0.75[5]	0.94[5]
Cadmium	-	-	-	60.0	107[5]	0.0046	-	-	-	-
Chromium	-	-	-	114	-	-	-	0.034[5,6]	-	-
Copper	-	-	-	12600[5]	12600[5]	0.062	0.016[5]	0.029[5,6]	-	-
Iron	22900[5]	-	4.93[5]	88400	179000	8.9	-	-	3180[5]	6700[5]
Lead	-	-	-	9000[5]	15900[5]	0.029	-	-	-	-
Manganese	-	-	0.101[5]	1240[5]	-	0.26	-	-	388[5]	344[5]
Mercury	-	-	-	2.55	7.95	-	0.00021[5]	0.00045[5]	-	4.3[5]
Nickel	-	-	-	302[5]	-	-	-	0.038[5,6]	-	-
Silver	-	-	-	29.0	-	-	-	-	-	-
Thallium	-	-	-	-	3.01	-	-	-	-	-
Vanadium	55.4[5]		-	29.9	-	-	-	-	-	-
Zinc	-	-	-	3010	-	-	-	-	-	-

1 95% Upper Confidence Limit (UCL), unless otherwise noted.
2 Includes soil from depths of 0 to 1 foot.
3 Includes soil from depths of 0 to 10 feet.
4 Not applicable;chemical not selected as COPC for this medium/site.
5 Maximum detection; calculated 95% UCL exceeded the maximum detected concentration
6 Detected only in filtered sample.
7 Sum of 1,2,3,4,6,7,8-HpCDD, total 1,2,3,4,6,7,8-HpCDF, total HpCDF, and total HpCDD. All congeners not present in same sample.
8 Sum 1,2,3,6,7,8-HxCDF and total HxCDF. All congeners not present in same sample

TABLE 8-3

EXPOSURE ASSUMPTIONS - CURRENT LAND USE RECEPTORS
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2

Pathway Parameters	Maintenance Worker	Adolescent Trespasser	Adult Recreational User	Units
Dermal Contact With Soil/Sediment				
Skin Surface Area	3,160	4,570/4,140[1]	5,170	cm^2
Adherence Factor	1.0	1.0	1.0	mg/cm^2
Absorption Factor	CSV[2]	CSV	CSV	unitless
Exposure Frequency	12	12	45	days/year
Exposure Duration	25	10	30	years
Body Weight	70	45	70	kg
Averaging Time - Noncancer	9,125	3,650	10,950	days
Averaging Time - Cancer	25,550	25,550	25,550	days
Incidental Ingestion of Soil/Sediment				
Ingestion Rate	200	100	100	mg/day
Exposure Frequency	12	12	45	days/year
Exposure Duration	25	10	30	years
Body Weight	70	45	70	years
Averaging Time - Noncancer	9,125	3,650	10,950	days
Averaging Time - Cancer	25,550	25,550	25,550	days
Dermal Contact with Surface Water				
Skin Surface Area	NA[3]	4,570	19,400	cm^2
Permeability Constant	NA	CSV	CSV	cm/hour
Exposure Time	NA	1	1	hours/day
Exposure Frequency	NA	12	45	days/year
Exposure Duration	NA	10	30	years
Body Weight	NA	45	70	kg
Averaging Time - Noncancer	NA	3,650	10,950	days
Averaging Time - Cancer	NA	25,550	25,550	days
Incidental Ingestion of Surface Water				
Ingestion Rate	NA	0.05	0.05	liters/hour
Exposure Time	NA	1	1	hours/day
Exposure Frequency	NA	12	45	days/year
Exposure Duration	NA	10	30	years
Averaging Time - Noncancer	NA	3,650	10,950	days
Averaging Time - Cancer	NA	25,550	25,550	days

TABLE 8-3

**EXPOSURE ASSUMPTIONS - CURRENT LAND USE RECEPTORS
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 2**

Pathway Parameters	Maintenance Worker	Adolescent Trespasser	Adult Recreational User	Units
Ingestion of Fish				
Bioconcentration Factor	NA	NA	CSV	liters/kg
Fraction Ingested from Contaminated Source	NA	NA	0.1	unitless
Ingestion Rate	NA	NA	0.284	kg/meal
Exposure Frequency	NA	NA	48	meals/year
Exposure Duration	NA	NA	30	years
Body Weight	NA	NA	70	kg
Averaging Time - Noncancer	NA	NA	10,950	days
Averaging Time - Cancer	NA	NA	25,550	days

1 soil/sediment
2 CSV – chemical-specific value
3 NA - Not applicable

TABLE 8-4

EXPOSURE ASSUMPTIONS - FUTURE LAND USE RECEPTORS
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2

Pathway Parameters	Adult Resident	Child Resident	Full-Time Employee	Construction Worker	Units
Inhalation of Fugitive Dust					
Inhalation Rate	NA[1]	NA	NA	4.8	m^3/hour
Absorption Factor	NA	NA	NA	0.125 – lungs 0.625 - gut	unitless
Exposure Time	NA	NA	NA	8	hours/day
Exposure Frequency	NA	NA	NA	180	days/year
Exposure Duration	NA	NA	NA	1	year
Body Weight	NA	NA	NA	70	kg
Averaging Time - Noncancer	NA	NA	NA	365	days
Averaging Time - Cancer	NA	NA	NA	25,550	days
Dermal Contact with Soil					
Skin Surface Area	5,230	3,910	3,160	4,300	cm^2
Adherence Factor	1.0	1.0	1.0	1.0	mg/cm^2
Absorption Factor	0.01/0.001[2]	0.01/0.001[2]	0.01/0.001[2]	0.01/0.001[2]	unitless
Exposure Frequence	350	350	250	180	days/year
Exposure Duration	6/24[3]	6	25	1	years
Body Weight	70	15	70	70	kg
Averaging Time - Noncancer	2,190/8,760	2,190	9,125	365	days
Averaging Time - Cancer	25,550	25,550	25,550	25,550	days
Incidental Ingestion of Soil					
Ingestion Rate	200	200	50	480	mg/day
Exposure Frequency	350	350	250	180	days/year
Exposure Duration	6/24	6	25	1	years
Body Weight	70	15	70	70	kg
Averaging Time - Noncancer	2,190/8,760	2,190	9,125	365	days
Averaging Time - Cancer	25,550	25,550	25,550	25,550	days
Dermal Contact with Groundwater					
Skin Surface Area	19,400	7,280	NA	4,300	cm^2
Permeability Constant	CSV[4]	CSV	NA	CSV	cm/hour
Exposure Time	12	12	NA	240	minutes/day
Exposure Frequency	350	350	NA	180	days/year
Exposure Duration	6/24	6	NA	1	years
Body Weight	70	15	NA	70	kg
Averaging Time - Noncancer	2,190/8,760	2,190	NA	365	days
Averaging Time - Cancer	25,550	25,550	NA	25,550	days

TABLE 8-4

EXPOSURE ASSUMPTIONS - FUTURE LAND USE RECEPTORS
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
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Pathway Parameters	Adult Resident	Child Resident	Full-Time Employee	Construction Worker	Units
Ingestion of Groundwater					
Ingestion Rate	2	1	NA	NA	liters/day
Exposure Frequency	350	350	NA	NA	days/years
Exposure Duration	6/24	6	NA	NA	years
Body Weight	70	15	NA	NA	kg
Averaging Time - Noncancer	2,190/8,760	2,190	NA	NA	days
Averaging Time - Cancer	25,550	25,550	NA	NA	days
Inhalation of Volatiles in Groundwater					
Inhalation Rate	10	10	NA	NA	liters/minute
Shower Duration	12	12	NA	NA	minutes
Total Time in Bathroom	20	20	NA	NA	minutes
Air Exchange Rate	0.0083	0.0083	NA	NA	per minute
Exposure Frequency	350	350	NA	NA	showers/year
Exposure Duration	6/24	6	NA	NA	years
Body Weight	70	15	NA	NA	kg
Averaging Time - Noncancer	2,190/8,760	2,190	NA	NA	days
Averaging Time - Cancer	25,550	25,550	NA	NA	days

1 NA - not applicable
2 organics/inorganics
3 adult evaluated for exposure durations of 6 and 24 years
4 CSV - chemical-specific value

Based on data collected from human studies, USEPA has developed weight-of-evidence classifications. Group A includes human carcinogens. Group B in includes probable human carcinogens. B1 indicates that limited data are available. B2 indicates sufficient evidence in animals and inadequate or no evidence in humans. Group C includes possible human carcinogens. Chemicals in Group D are not classifiable as to human carcinogenicity. Group E indicates evidence of noncarcinogenicity for humans.

The increased cancer risk is expressed by terms such as 1E-6. To state that a chemical exposure causes a 1E-6 added upper limit risk of cancer means that if one million people are exposed, one additional incident of cancer is expected to occur. The calculations and assumptions yield an upper limit estimate that assures that no more than one case is expected and, in fact, there may be no additional cases of cancer. USEPA policy has established that an upper limit cancer risk falling below or within the range of 1E-6 to 1E-4 is acceptable.

RfDs have been developed by USEPA for indicating the potential for adverse health effects from exposure to a COPC exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure for humans, including sensitive individuals. Estimated intakes of COPCs from environmental media (e.g., the amount of a COPC ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). If the estimated exposure to a chemical, expressed as mg/kg-day, is less than the RfD, exposure is not expected to cause any noncarcinogenic effects, even If exposure is continued for a lifetime. In other words, if the estimated dose divided by the RfD is less than 1.0, there is no concern for adverse noncarcinogenic effects.

Dose-response parameters (CSFs, RfDs, absorption factors, and weight of evidence) used in the risk assessment are summarized in ***Table 8-5.***

8.1.4 Risk Characterization

For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk was calculated from the following equation:

TABLE 8-5

DOSE-RESPONSE PARAMETERS FOR CHEMICALS OF POTENTIAL CONCERN[1]
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 5

Chemical	Chronic/Subchronic RfD (mg/kg-day)[2]			CSF(mg/kg-day)[3]			GI[4] Absorption Factor	Weight of Evidence
	Inhalation	Oral	Dermal	Inhalation	Oral	Dermal		
VOLATILE ORGANICS								
Benzene	1.71E-3[5] (UF = 1000; hematopoietic system	3E-4[6]	3E-4	2.9E-2 (leukemia, neoplasia)	2.9E-2 (leukemia, neoplasia)	2.9E-2	1.0[7]	A
Bromodichloromethane		2E-2 (UF = 1000; kidney)	1.6E-2		6.2E-2 (liver)	7.75E-2	0.80[8]	B2
Chloroform		1E-2 (UF = 1000; liver)	1E-2	8.05E-2 (liver)	6.1E-3 (kidney)	6.1E-3	1.0[9]	B2
cis-1,2-Dichloroethene		1E-2/1E-1 (UF = 3000/300; blood)	8E-3/8E-2				0.80[8]	D
trans-1,2-Dichloroethene		2E-2/2E-1 (UF = 1000/100; blood)	1.6E-2/1.6E-1				0.80[8]	D
Vinyl chloride				3.0E-1[10] (liver)	1.9E+0[10] (lung, liver)	2.38E+0	0.80[8]	A
SEMIVOLATILE ORGANICS								
Benzo(a)anthracene				3.1E-1[11]	7.3E-1[11] (liver)	3.65E-1	0.50[8]	B2
Benzo(a)pyrene				3.1E+0[12] (respiratory tract)	7.3E+0 (forestomach, larynx, esophagus)	3.65E+0	0.50[8]	B2
Benzo(b)fluoranthene				3.1E-1[11]	7.3E-1[11] (liver)	3.65E-1	0.50[8]	B2

TABLE 8-5

DOSE-RESPONSE PARAMETERS FOR CHEMICALS OF POTENTIAL CONCERN[1]
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
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Chemical	Chronic/Subchronic RfD (mg/Kg-day)(2)			CSF (mg/kg-day)(3)			GI[4] Absorption Factor	Weight of Evidence
	Inhalation	Oral	Dermal	Inhalation	Oral	Dermal		
Benzo(k)fluoranthene				3.1E-2[11]	7.3E-2[11] (liver)	3.65E-2	0.50[8]	B2
Bis(2-ethylhexyl)phthalate		2E-2 (UF = 1000; liver)	1.1E-2		1.4E-2 (liver)	2.55E-2	0.55[13]	B2
Chrysene				3.1E-3[11] (liver)	7.3E-3[11]	3.65E-3	0.50[8]	B2
Dibenz(a,h)anthracene				3.1E+0[11]	7.3E-+0[11] (liver)	3.65E+0	0.50[8]	B2
Indeno(1,2,3-cd)pyrene				3.1E-1[11]	7.3E-1[11] (liver)	3.65E-1	0.50[8]	B2
2-Methylnaphthalene[24]		4E-2	2E-2				0.50[8]	D
Pentachlorophenol		3E-2 (UF = 100; liver, kidney)	1.5E-2		1.2E-1 (liver, adrenal)	6E-2	0.50[8]	B2
PESTICIDES/PCBs								
Aroclors					7.7E+0 (liver)	1.5E+1	0.50[8]	B2
Chlordane		6E-5 (UF = 1000; liver)	4.8E-5	1.29E+0 (liver)	1.3E+0 (liver)	1.6E+0	0.80[14]	B2
Dieldrin		5E-5 (UF = 100;liver)	2.5E-5	1.6E+1 (liver)	1.6E+1 (liver)	3.2E+0	0.50[8]	B2
4,4'-DDT		5E-4 (UF = 100; liver)	4E-4	3.4E-1 (liver)	3.4E-1 (liver)	4.25E-1	0.80[15]	B2

TABLE 8-5

DOSE-RESPONSE PARAMETERS FOR CHEMICALS OF POTENTIAL CONCERN[1]
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
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Chemical	Chronic/Subchronic RfD (mg/kg-day)[2]			CSF (mg/kg-day)[3]			GI[4] Absorption Factor	Weight of Evidence
	Inhalation	Oral	Dermal	Inhalation	Oral	Dermal		
Endosulfan I		6E-3 (UF = 100; weight gain; circulatory)	3E-3				0.50[8]	
DIOXINS/FURANS								
OCDD				1.1E+2[11] (respiratory system	1.6E+2[11] (lung; liver)	3.2E+2	0.50[8]	B2
1,2,3,4,6,7,8-HpCDD				1.1E+3[11] (respiratory system)	1.6E+3[11] (lung; liver)	3.2E+3	0.50[8]	B2
1,2,3,4,6,7,8-HpCDF				1.1E+3[11] (respiratory system)	1.6E+3[11] (lung; liver)	3.2E+3	0.50[8]	B2
1,2,3,6,7,8-HxCDF				1.1E+4[11] (respiratory system)	1.6E+4[11] (lung; liver)	3.2E+4	0.50[8]	B2
INORGANICS								
Aluminum		1E+0[5]	2E-1				0.20[8]	
Antimony		4E-4 (UF = 1000; whole body, blood)	8E-5				0.20[8]	
Arsenic		3E-4 (UF = 3; skin)	2.85E-4	1.51E+1 (lung)	1.5E+0 (skin)	1.6E+0	0.95[16]	A
Barium	1.43E-4[10](UF = 1000; fetus)	7E-2 (UF = 3; cardiovascular system)	1.4E-2				0.20[8]	

TABLE 8-5

DOSE-RESPONSE PARAMETERS FOR CHEMICALS OF POTENTIAL CONCERN[1]
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
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Chemical	Chronic/Subchronic RfD (mg/kg-day)[2]			CSF(mg/kg-day)[3]			GI[4] Absorption Factor	Weight of Evidence
	Inhalation	Oral	Dermal	Inhalation	Oral	Dermal		
Beryllium		5E-3 (UF = 1000)	5E-5	8.4E+0 (lung, osteosarcomas)	4.3E+0 (lung, osteosarcomas)	4.3E+2	0.01[17]	B2
Cadmium		5E-4 (UF = 10; kidney)	1.5E-5	6.3E+0(lung, trachea)			0.03[18]	B1
Chromium VI		5E-2/2E-2 (UF = 500)	5E-5	4.2E+1 (lung)			0.01[19]	A
Copper		4E-2[5] (gastrointestinal system)	2.4E-2				0.06[20]	
Iron		3E-1	6E-2				0.20[8]	
Lead								B2
Manganese	1.43E-5 (UF = 1000; CNS)	2.4E-2 (UF = 3; CNS)	4.6E-3				0.20[8]	D
Mercury	8.57E-5[10] (UF = 30; CNS)	3E-4[10] (UF = 1000; kidney)	6E-5				0.20[8]	D
Nickel		2E-2 (UF = 300; body weight)	8E-4				0.04[21]	
Silver		5E-3 (UF = 3; argyria)	1E-3				0.20[8]	
Thallium		7E-5[22,23] (UF = 3000; liver, blood, hair)	1.4E-5				0.20[8]	D

TABLE 8-5

DOSE-RESPONSE PARAMETERS FOR CHEMICALS OF POTENTIAL CONCERN[1]
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
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Chemical	Chronic/Subchronic RfD (mg/kg-day)[2]			CSF (mg/kg-day)[3]			GI[4] Absorption Factor	Weight of Evidence
	Inhalation	Oral	Dermal	Inhalation	Oral	Dermal		
Vanadium		7E-3[10]	1.4E-3				0.20[8]	
Zinc		3E-1 (UF = 3; enzyme)	6E-2				0.20[8]	D

1 Values obtained from Integrated Risk Information System (IRIS; USEPA, 1996), unless otherwise noted.
2 Reference Dose
3 Cancer Slope Factor.
4 Gastrointestinal.
5 ECAO provisional value listed in USEPA Region 3, 1996.
6 USEPA Region 4 provisional value identified in comments received. Uncertainty factor and target organs not available.
7 ATSDR. 1991b.
8 Assumed (USEPA Region 4 default values, 1995).
9 ATSDR, 1991f.
10 HEAST, FY-1995 (USEPA, 1995).
11 Based on Region 4 Toxicity Equivalence Factors (TEAF; USEPA Region 4, 1995).
12 Provisional value listed in USEPA Region 4, 1995.
13 ATSDR, 1991d.
14 ATSDR, 1992a.
15 ATSDR, 1992b.
16 ATSDR, 1991a.
17 ATSDR, 1991c.
18 ATSDR, 1991e.
19 ATSDR, 1991g.
20 ATSDR, 1989.
21 ATSDR, 1991h.
22 Listed as thallic oxide.
23 Withdrawn from IRIS.
24 Values for naphthalene are presented.

$$Risk = CDI \times CSF$$

Where:

Risk = a unitless probability (e.g., 2E-6) of an individual developing cancer

CDI = chronic daily intake averaged over 70 years (mg/kg-day)

CSF = cancer slope factor, expressed as $(mg/kg\text{-}day)^{-1}$

These risks are probabilities that are generally expressed in scientific notation (e.g., 1E-6). An ILCR of 1 E-6 indicates that, as a reasonable maximum estimate, an individual has a one-in-one-million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at OU3.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a reference dose derived for a similar exposure period. The ratio of exposure to toxicity is called a Hazard Quotient (HQ). By adding the HQs for all COPCs that affect the same target organ (e.g, liver) within a medium or across all media to which a given population may be reasonably exposed, the Hazard Index (HI) can be generated.

The HQ is calculated as follows:

$$\text{Non-cancer HQ} = CDI/RfD$$

Where:

CDI = chronic daily intake

RfD = reference dose

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short-term). .

To evaluate cancer risks, a risk level lower than 1E-6 is considered a minimal or de minimis risk. The risk range of 1E-6 to 1E-4 is an acceptable risk range and would not be expected to require a response action. A risk level greater than 1E-4 would be evaluated further, and remedial action to decrease the estimated risk would be considered.

An HI of less than unity (1.0) indicates that the exposures are not expected to cause adverse health effects. An HI greater than 1.0 requires further evaluation. For example, although HQs of the several chemicals present are added and exceed 1.0, further evaluation may show that their toxicities are not additive because each chemical affects different target organs. When total effects are evaluated on an effect and target organ basis, the separate chemicals may be present at acceptable concentrations.

Carcinogenic risks and noncarcinogenic hazards were evaluated for potential exposures to media-specific COPCs in surface soil, subsurface soil, surface water, sediment, and groundwater. Receptor populations that may potentially be exposed are maintenance workers, construction workers, adolescent trespassers, adult recreational users, full-time employees, and adult and child residents who could, theoretically, use groundwater for a household water source. Risks and hazards estimated for the identified receptors at OU3 are provided in ***Table 8-6.***

8.1.4.1 Site 6

Ingestion of groundwater by future adult and child residents over a 6-year period would present unacceptable noncarcinogenic risks due mainly to the presence of arsenic. In addition, the presence of arsenic in the soil would present unacceptable noncarcinogenic and carcinogenic risks to a future child resident ingesting the soil. For the sake of completeness, a 30-year residential exposure scenario was also evaluated. This scenario is highly unlikely as long as the property remains in military use (i.e., a 30year residence is extremely conservative). The incremental cancer risk (ICR) associated with exposure for this receptor assumes 6 years as a small child and an additional 24 years of exposure as an older child and adult. The ICR for the adult receptor under this scenario was 3.9E-4,, which exceeds the USEPA target risk range. In addition, the HI for both the child (7.6) and adult (1.8) exceed 1.0. Risks to all other receptors were within or below the target risk range.

It should be noted that the concentrations of arsenic in the groundwater at Site 6 were below MCLs and state groundwater standards. In addition, the future use of the groundwater in the surficial aquifer as a drinking water source is extremely unlikely, because the Air Station has a separate water supply that draws from deeper aquifers (Castle Hayne aquifers). Therefore, the risks presented by the ingestion of groundwater may be overly conservative. It should also be noted that the concentration of arsenic in the soil at Site 6 that was used for the risk assessment was the maximum concentration detected. All other detections were within the range of background concentrations. Therefore, the risks presented by ingestion of soil may be overly conservative.

Cumulative risks to both trespassers and recreational users due to exposure to surface water and sediment were within or below the USEPA range of acceptable risks.

TABLE 8-6

SUMMARY OF CUMULATIVE RISKS
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Receptor	Exposure Pathway	Site 6		Site 7	
		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
Maintenance Worker	Direct contact with surface soil.	3.7E-6	0.032	2.7E-6	0.12
Construction Worker	Direct contact with soil and groundwater; inhalation of fugitive dust.	4.4E-6	0.57	4.5E-6	7.1*(1)
Adolescent Trespasser	Direct contact with surface soil.	9.9E-7	0.015	7.7E-7	0.068
	Direct contact with Slocum Creek water and sediment(2).	2.3E-7	0.0061		
	Direct contact with Luke Rowe's Gut water and sediment(2).	1.8E-7	0.0046		
Adult Recreational User	Direct contact with Slocum Creek water and sediment, ingestion of fish(2).	1.9E-6	0.034		
Full-Time Employee	Direct contact with surface soil.	2.8E-5	0.19	2.1E-5	0.80
Adult Resident (6-year)	Direct contact with groundwater and surface soil.	4.9E-5	1.8*	1.2E-4*	9.5*
Child/Adult Resident (30-year)	Direct contact with groundwater and surface soil.	3.9E-4*	7.6 (child)* 1.8 (adult)*	8.0E-4*	33.8(child)* 9.5(adult)*
Child Resident (6-year)	Direct contact with groundwater and surface soil.	2.0E-4*	7.6*	3.3E-4*	33.8*

1 An asterisk indicates an "unacceptable" risk.
2 This exposure pathway was evaluated only once

8.1.4.2 Site 7

Ingestion of groundwater by future adult (6-year) and child (6-year) residents would present unacceptable carcinogenic and noncarcinogenic risks due mainly to the presence of arsenic, vinyl chloride, benzene, antimony, and iron. In addition, other receptors that may be exposed to unacceptable risks include a 6-year child resident (dermal contact and incidental ingestion of soil), 30-year adult resident (incidental ingestion of soil), and construction worker (incidental ingestion of soil). Risks for soil were mainly related to the presence of antimony, arsenic, cadmium, copper, and iron. Risks for all other receptors were within or below the target risk range.

Lead was detected in the soil at Site 7 at levels above the recommended screening levels for both a residential setting (400 mg/kg) and an industrial setting (1,300 mg/kg).

As with the groundwater at Site 6, it should be noted that the concentrations of arsenic in the groundwater at Site 7 were below MCLs and state groundwater standards. In addition, vinyl chloride was detected only once in the latest round of groundwater sampling. The potential for future uses of groundwater in the surficial aquifer as a drinking water source is unlikely. Therefore, the risks presented by the ingestion of groundwater may be overly conservative.

8.1.5 Risk Uncertainty

This section identifies important uncertainties and limitations associated with the baseline human health risk assessment. Exposure scenarios based on USEPA guidance use conservative assumptions, which means actual risk will not be greater than that estimated and may be lower. For this reason, estimated cancer risks based on USEPA guidance, such as those presented in this document, may not represent actual risks to the population.

Because of data set limitations, the 95th percentile may exceed the maximum concentration reported in some evaluations. This may occur when there are a large number of nondetects and the detection limits are unusually high due because of interferences in the analyses. In these cases, consistent with USEPA Region 4 guidance, the maximum reported values were used as exposure point concentrations to estimate human exposures. Although the use of maximum values is generally recognized as an appropriate screening approach, this procedure may overestimate actual exposure.

This is also the case for use of detection limits as nondetect values when a chemical has been reported as not detected in most of the samples collected and analyzed. Because some nondetects may be zero, assuming that a concentration equal to half the detection limit is present may overestimate actual

chemical concentrations on site. This is particularly true if interfering chemicals affect the analyses, and the nondetect value is elevated.

Environmental sampling and analysis can contain significant errors and artifacts. At OU3, data used in the risk assessment are believed to adequately and accurately represent current conditions.

When long-term health effects are evaluated, it is assumed that chemical concentrations are constant for the exposure period being evaluated. However, reported chemical concentrations change because of various degradation processes (e.g., dilution by uncontaminated water, sorption, dispersion of contaminated groundwater, volatilization, biodegradation, chemical degradation, photodegradation). Use of steady-state conditions will likely overestimate exposure.

Exposures to vapors at the site, fugitive dust (except for future construction workers), dermal contact with groundwater from household uses other than bathing (e.g., laundry, washing dishes), and other possible exposures to site media were not evaluated. Although these and other exposures could occur, the magnitudes of these exposures are expected to be much lower than the exposures evaluated and would not quantitatively affect the total health impact from the site.

Because groundwater from the surficial aquifer in the surrounding area is not used for drinking water or other household water needs, exposures related to drinking and bathing are theoretical and relate to potential future exposures. This is unlikely because the Air Station has a separate potable water distribution system.

In hazard and risk evaluations, risks or hazards presented by several chemicals reported for the same exposure have been added to provide a sum of estimated total risk or hazard for that particular exposure. This is a conservative assumption and is scientifically accurate only in those instances where health effects of individual chemicals are directed at the same effect and same target organ. Effects may be additive, synergistic, or antagonistic. Because many chemicals have no similarity as to their noncarcinogenic action or target of their action, this approach may overestimate risk.

Risks calculated from slope factors are derived using a linearized multistage procedure; therefore, they are likely to be conservative upper-bound estimates. Actual risks may be much lower.

Toxicity information is not available for all COPCs. Because RfDs, CSFs, and other toxicity criteria are not available for all identified chemicals, it is impossible to qualitatively or quantitatively assess the risks associated with exposure to some substances. Some compounds were not selected as COPCs based on screening values for similar compounds. There is no toxicity information for lead.

Some uncertainty is associated with the evaluation of carcinogenic effects from oral exposure to arsenic, which has no published oral CSF. The uncertainties associated with the ingestion of arsenic are high, such that estimated risks may be overestimated by as much as an order of magnitude.

8.1.6 Human Health Risk Summary

Risk and hazards associated with exposure to all environmental media (and combinations) were within the USEPA acceptable ranges for the current maintenance worker, adolescent trespasser, and adult recreational user and for the future full-time employee.

For the unlikely hypothetical future site resident, exposure to surface soil and surficial aquifer groundwater were shown to exceed acceptable residential goals. For the future construction worker, exposure to soil was shown to exceed acceptable industrial goals.

For future residents, several chemicals have individual cancer risks greater than 1E-6, an HI greater than 0.1, or were detected at concentrations greater that the state groundwater standard, making them COCs for groundwater. These analytes are as follows: benzene, vinyl chloride, bis(2-ethylhexyl)phthalate, 2-methylnaphthalene, pentachlorophenol, 4,4'-DDT, dieldrin, endosulfan I, aluminum, antimony, arsenic, barium, cadmium, copper, iron, lead, and manganese.

Exposure to soil at OU3 results in unacceptable risks for future residents and future construction workers. In addition, several chemicals contributed individual ICRs greater than 1E-6 or HIs greater than 0.1 for full-time employees and maintenance workers, making them COCs for soil. COCs for soil are as follows: dioxins/furans, benzo(a)pyrene, dibenz(a,h)anthracene, Aroclors, dieldrin, aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, thallium, vanadium, and zinc.

Although there were no unacceptable risks from exposure to Slocum Creek sediment, beryllium contributed an HI greater than 0.1, making it a COC for Slocum Creek sediment.

USEPA Region 4 requires, as part of the risk assessment, an estimation of Remedial Goal Options (RGOs) for three risk range levels for any receptor for which an individual chemical has an ICR greater than 1E-6 or an HI greater than 0.1.

Tables 8-7 and ***8-8*** present RGOs for groundwater for the 6-year resident and 30-year resident exposures, respectively. These tables also provide state groundwater standards and federal MCLs.

TABLE 8-7

PRELIMINARY REMEDIAL GOAL OPTIONS FOR GROUNDWATER – FUTURE RESIDENT (6-YEAR)[1]
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	RGOs for Target Hazard Quotient (µg/L)			RGOs for Target Cancer Risk (µg/L)			NC Class GA Standard (µg/L)	Federal MCL (µg/L)
	0.1	1	10	1E-6	1E-5	1E-4		
Benzene	0.41	4.1	41	3.8	38	380	1.0	5.0
Vinyl chloride	NA[2]	NA	NA	0.086	0.86	8.6	0.015	2.0
Bis(2-ethylhexyl)phthalate	29	290	2,900	12	120	1,200	3.0	6.0
Pentachlorophenol	16	160	1,600[3]	10[3]	10[3]	100[3]	0.3	1.0
2-Methylnaphthalene	60[3]	600[3]	6,000[3]	NA	NA	NA	DL[6]	NS
4,4'-DDT	0.43[3]	4.3[3]	43[3]	0.29[3]	2.9[3]	29[3]	DL	NS
Endosulfan I	9.1[3]	91[3]	9,100[3]	NA	NA	NA	DL	NS
Dieldrin	NA[4]	NA[4]	NA[4]	0.011	0.11	1.1	DL	NS
Aluminum	1,500	15,000	150,000	NA	NA	NA	NS[7]	50-200[8]
Antimony	0.62	6.2	62	NA	NA	NA	NS	6.0
Arsenic	0.47	4.7	47	0.12	1.2	12	50	50
Barium	110	1,100	11,000	NA	NA	NA	2,000	2,000
Cadmium	0.74	7.4	74	NA	NA	NA	5.0	5.0
Copper	63	630	6,300	NA	NA	NA	1,000	1,000[8]
Iron	470	4,700	47,000	NA	NA	NA	300	300[8]
Lead	[5]	[5]	[5]	[5]	[5]	[5]	15	15
Manganese	37	370	3,700	NA	NA	NA	50	50 [8]

1 Lower of adult or child RGO selected for each chemical.
2 NA – Not applicable.
3 Concentrations exceed state standards. Therefore RGOs were calculated even though total ICR was less than 1E-6 and total HI was less than 0.1.
4 NA – Not applicable because total HI was less than 0.1.
5 Action level for lead is 15 µg/L.
6 DL – Detection limit. Any detection is considered an exceedance of state standard.
7 NS – No Standard.
8 Secondary MCL.

TABLE 8-8

PRELIMINARY REMEDIAL GOAL OPTIONS FOR GROUNDWATER – FUTURE RESIDENT (30-YEAR)[1]
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	RGOs for Target Hazard Quotient (µg/L)			RGOs for Target Cancer Risk (µg/L)			NC Class GA Standard (µg/L)	Federal MCL (µg/L)
	0.1	1	10	1E-6	1E-5	1E-4		
Benzene	0.28	2.8	28	1.6	16	160	1.0	5.0
Vinyl chloride	NA[1]	NA	NA	0.033	0.33	3.3	0.015	2.0
Bis(2-ethylhexyl)phthalate	19	190	1,900	4.3	43	430	3.0	6.0
Pentachlorophenol	11[2]	110[2]	1,100[2]	0.36	3.6	36	0.3	1.0
2-Methylnaphthalene	42[3]	420[3]	4,200[3]	NA	NA	NA	DL[5]	NS
4,4'-DDT	0.29[3]	2.9[3]	29[3]	0.1[3]	1.0[3]	10[3]	DL	NS
Endosulfan I	6.3[3]	63[3]	630[3]	NA	NA	NA	DL	NS
Dieldrin	0.051	0.51	5.1	0.0039	0.039	0.39	DL	NS
Aluminum	1,100	11,000	110,000	NA	NA	NA	NS[6]	50-200[7]
Antimony	0.44	4.4	44	NA	NA	NA	NS	6.0
Arsenic	0.33	3.3	33	0.045	0.45	4.5	50	50
Barium	76	760	7,600	NA	NA	NA	2,000	2,000
Cadmium	0.52	5.2	52	NA	NA	NA	5.0	5.0
Copper	45	450	4,500	NA	NA	NA	1,000	1,000[7]
Iron	330	3,300	33,000	NA	NA	NA	300	300[7]
Lead	(4)	(4)	(4)	(4)	(4)	(4)	15	15
Manganese	26	260	2,600	NA	NA	NA	50	50 [7]

1 NA – Not applicable.
2 Concentrations exceeded state standards. Therefore RGOs were calculated even though total HI was less than 0.1.
3 Concentrations exceeded state standards. Therefore RGOs were calculated even though total ICR was less than 1E-6 and total Hl was less than 0.1.
4 Action level for lead is 15 µg/L.
5 DL – Detection limit. Any detection is considered an exceedance of state standard.
6 NS – No standard.
7 Secondary MCL.

Tables 8-9, 8-10, 8-11, 8-12, and ***8-13*** present RGOs for soil for the 6-year resident, 30-year resident, construction worker, full-time employee, and maintenance worker exposures, respectively.

Table 8-14 presents RGOs for sediment for the adult recreational user exposure.

In addition to COCs based on risk (e.g., protection of human health), concentrations of many groundwater analytes exceeded state standards or MCLs, and concentrations of several soil analytes exceeded concentrations based on protection of groundwater, also making them COCs. ***Table 8-15*** presents the chemicals that exceeded state groundwater protection standards or MCLs. Benzene and 2-methylnaphthalene were detected in soil at concentrations above those calculated to be protective of groundwater. The RGOs are as follows: benzene (15 µg/kg) and 2-methylnaphthalene (8,570 µg/kg).

Actual or threatened releases of hazardous substances from OU3, if not addressed by implementing the remedy selected in this ROD, may present a potential threat to public health, welfare, or the environment.

8.2 ECOLOGICAL RISK ASSESSMENT

No critical habitats or endangered species or habitats are affected by site contamination. Several wetland areas were identified at OU3 during a field survey conducted in April 1995. A Carex sp. marsh was identified in a low area of Site 7. Wet pine flatwoods were located north of Luke Rowe's Gut adjacent to Slocum Creek. Coastal plain small stream swamp areas were identified on both sides of Luke Rowe's Gut, and a small area of tidal freshwater marsh was located on both sides of the mouth of Luke Rowe's Gut.

The maximum surface water and sediment exposure point concentrations and estimated dose received by receptors were compared to benchmark values protective of ecological receptors. The maximum and mean (average of positive detections) soil exposure point concentrations and estimated dose received by receptors were also compared to benchmark values that are protective of ecological receptors. Contaminants exceeding these values were regarded as ecological COPCs, and their toxicological properties were summarized. The relative potential risks that each of these COPCs might pose to ecological receptors inhabiting the area near OU3 were then evaluated in the form of HQs.

The results of the ecological assessment indicate that some contaminants are present in OU3 surface water, sediment, and surface soil at concentrations that exceed screening benchmarks. However, risks implied by most of these exceedances are mitigated by several factors.

TABLE 8-9

PRELIMINARY REMEDIAL GOAL OPTIONS FOR GROUNDWATER – FUTURE RESIDENT (6-YEAR)[1]
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	RGOs for Target Hazard Quotient (mg/kg)			RGOs for Target Cancer Risk (mg/kg)		
	0.1	**1**	**10**	**1E-6**	**1E-5**	**1E-4**
HpCDD/HpCDF	NA[2]	NA	NA	0.00041	0.0041	0.041
HxCDF	NA	NA	NA	0.000041	0.00041	0.0041
OCDD	NA	NA	NA	0.0042	0.042	0.42
Benzo(a)pyrene	NA	NA	NA	0.12	1.2	12
Dibenz(a,h)anthracene	NA	NA	NA	0.11	1.1	11
Aroclors	NA	NA	NA	0.085	0.85	8.5
Dieldrin	NA[3]	NA[3]	NA[3]	0.059	0.59	5.9
Aluminum	7,000	70,000	700,000	NA	NA	NA
Antimony	2.8	28	280	NA	NA	NA
Arsenic	2.3	23	230	0.59	5.9	59
Barium	510	5,100	51,000	NA	NA	NA
Beryllium	NA[3]	NA[3]	NA[3]	0.072	0.72	7.2
Cadmium	2.4	24	240	NA	NA	NA
Chromium (VI)	38	380	3,800	NA	NA	NA
Copper	310	3,100	31,000	NA	NA	NA
Iron	2,200	22,000	220,000	NA	NA	NA
Lead	[4]	[4]	[4]	[4]	[4]	[4]
Manganese	170	1,700	17,000	NA	NA	NA
Mercury	2.1	21	210	NA	NA	NA
Nickel	110	1,100	11,000	NA	NA	NA
Vanadium	50	500	5,000	NA	NA	NA
Zinc	2,100	21,000	210,000	NA	NA	NA

1 Lower of adult or child RGO selected for each chemical.
2 NA – Not applicable.
3 NA – Not applicable because the total HI was less than 0.1.
4 Lead action level for residential soil is 400 mg/kg (USEPA, 1994).

TABLE 8-10

PRELIMINARY REMEDIAL GOAL OPTIONS FOR GROUNDWATER – FUTURE RESIDENT (30-YEAR)
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	RGOs for Target Hazard Quotient (mg/kg)			RGOs for Target Cancer Risk (mg/kg)		
	0.1	**1**	**10**	**1E-6**	**1E-5**	**1E-4**
HpCDD/HpCDF	NA[1]	NA	NA	0.00026	0.0026	0.026
HxCDF	NA	NA	NA	0.000026	0.00026	0.0026
OCDD	NA	NA	NA	0.0025	0.025	0.25
Aroclors	NA	NA	NA	0.053	0.53	5.3
Dieldrin	NA[2]	NA[2]	NA[2]	0.037	0.37	3.7
Benzo(a)pyrene	NA	NA	NA	0.075	0.75	7.5
Dibenz(a,h)anthracene	NA	NA	NA	0.077	0.77	7.7
Aluminum	6,200	62,000	620,000	NA	NA	NA
Antimony	2.5	25	250	NA	NA	NA
Arsenic	2.1	21	210	0.42	4.2	42
Barium	460	4,600	46,000	NA	NA	NA
Beryllium	NA[2]	NA[2]	NA[2]	0.039	0.39	3.9
Cadmium	2.0	20	200	NA	NA	NA
Chromium (VI)	35	350	3,500	NA	NA	NA
Copper	270	2,700	27,000	NA	NA	NA
Iron	1,900	19,000	190,000	NA	NA	NA
Lead	(3)	(3)	(3)	(3)	(3)	(3)
Manganese	150	1,500	15,000	NA	NA	NA
Mercury	2.0	20	200	NA	NA	NA
Nickel	92	920	9,200	NA	NA	NA
Vanadium	46	460	4,600	NA	NA	NA
Zinc	1,900	19,000	190,000	NA	NA	NA

1 NA – Not applicable
2 NA – Not applicable because the total HI was less than 0.1.
3 Lead action level for residential soil is 400 mg/kg (USEPA, 1994).

TABLE 8-11

PRELIMINARY REMEDIAL GOAL OPTIONS FOR SOIL – CONSTRUCTION WORKER
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	RGOs for Target Hazard Quotient (mg/kg)			RGOs for Target Cancer Risk (mg/kg)		
	0.1	1	10	1E-6	1E-5	1E-4
Antimony	11	110	1,100	NA	NA	NA
Arsenic	8.7	87	870	13	130	1,300
Cadmium	11	110	1,100	NA(2)	NA(2)	NA(2)
Copper	1,100	11,000	110,000	NA	NA	NA
Iron	8,600	86,000	860,000	NA	NA	NA
Lead	(3)	(3)	(3)	(3)	(3)	(3)
Thallium	1.9	19	190	NA	NA	NA

1 NA – Not applicable

2 NA – Not applicable because the total ICR was less than 1E-6.

3 Lead action level in non-residential soil is 1,300 mg/kg (verbal comments from USEPA and NCDENR on OU3 RI submitted October 1995).

TABLE 8-12

PRELIMINARY REMEDIAL GOAL OPTIONS FOR SOIL – FULL-TIME EMPLOYEE
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	RGOs for Target Hazard Quotient (mg/kg)			RGOs for Target Cancer Risk (mg/kg)		
	0.1	1	10	1E-6	1E-5	1E-4
HpCDD/HpCDF	NA[1]	NA	NA	0.0016	0.016	0.16
HxCDF	NA	NA	NA	0.00017	0.0017	0.017
Antimony	60	600	6,000	NA	NA	NA
Arsenic	NA[2]	NA[2]	NA[2]	3.6	36	360
Beryllium	NA[2]	NA[2]	NA[2]	0.18	1.8	18
Cadmium	33	330	3,300	NA	NA	NA
Copper	7,400	74,000	740,000	NA	NA	NA
Iron	47,000	470,000	4,700,000	NA	NA	NA
Lead	(3)	(3)	(3)	(3)	(3)	(3)

1 NA – Not applicable
2 NA – Not applicable because the total HI was less than 0.1.
3 Lead action level in non-residential soil is 1.300 mg/kg (verbal comments from USEPA and NCDENR on OU3 RI submitted October 1995).

TABLE 8-13

PRELIMINARY REMEDIAL GOAL OPTIONS FOR SOIL – MAINTENANCE WORKER
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	RGOs for Target Hazard Quotient (mg/kg)			RGOs for Target Cancer Risk (mg/kg)		
	0.1	1	10	1E-6	1E-5	1E-4
Arsenic	NA(1)	NA	NA	20	200	2,000

1 NA – Not applicable because total HI was less than 0.1.

TABLE 8-14

PRELIMINARY REMEDIAL GOAL OPTIONS FOR SLOCUM CREEK SEDIMENT
ADULT RECREATIONAL USER
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Analyte	RGOs for Target Hazard Quotient (mg/kg)			RGOs for Target Cancer Risk (mg/kg)		
	0.1	1	10	1E-6	1E-5	1E-4
Beryllium	NA(1)	NA	NA	0.52	5.2	52

1 NA – Not applicable because total HI was less than 0.1.

TABLE 8-15

GROUNDWATER COCs THAT EXCEED MCLs OR STATE GROUNDWATER STANDARDS
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Chemical of Concern	NC Class GA Standard	Federal MCL
VOLATILE ORGANICS (µg/L)		
Benzene	1.0	5.0
Vinyl chloride	0.015	2.0
SEMIVOLATILE ORGANICS (µg/L)		
Bis(2-ethylhexyl)phthalate	3.0	6.0
2-Methylnaphthalene	DL(1)	NS(2)
Pentachlorophenol	0.3	1.0
PESTICIDES (µg/L)		
4,4'-DDT	DL	NS
Dieldrin	DL	NS
Endosulfan I	DL	NS
INORGANICS (µg/L)		
Barium	2,000	2,000
Cadmium	5.0	5.0
Iron	300	300(3)
Lead	15	15
Manganese	50	50(3)

1 DL – Detection limit. Any detection is considered an exceedance of state standard.

2 NS – No standard.

3 Secondary MCL.

In Luke Rowe's Gut only a few COPCs were identified in the surface water samples. No COPCs were identified in the sediment samples, although several compounds were detected at concentrations above the preliminary levels protective of the environment. However, they were not considered to be COPCs because the detections of these compounds appear to be isolated occurrences. Because few, if any, compounds were identified as COPCs, widespread contamination and significant potential risks are considered to be absent in Luke Rowe's Gut. Some COPCs were identified in Slocum Creek surface water and sediment samples, but for the most part, these compounds are not believed to be related to OU3, as evidenced by the presence of elevated concentrations in the upgradient samples. Therefore, the marine ecological risk assessment was separated from the RI and will be performed under a different OU.

In surface soils, potential risks were assessed using two approaches. For the first approach, maximum contaminant concentrations in surface soils were compared to conservative screening levels that were based mainly on human health risks. To reduce uncertainties and generate a risk range, mean contaminant concentrations were then compared to more realistic but generally less conservative ecologically-based benchmarks. Most of the COPCs from the conservative first screening were not retained as COPCs using the mean concentrations and ecologically-based benchmarks, although a few metals still had slightly elevated HQ values. However, most of the elevated detections of those metals were located in a relatively small portion of OU3, and the habitat in that area is marginal.

For the second approach, terrestrial foodchain modeling using representative terrestrial receptors was performed to investigate potential ecological risks from surface soil contaminants. Based on maximum contaminant concentrations and several conservative assumptions, HI values for all receptors were high. To reduce uncertainties and generate a risk range, mean contaminant concentrations were then used. HI values were reduced by approximately one-half for all contaminants for all receptors, but were still relatively high. However, most of the remaining HI values were a result of the conservative assumptions in the models. In addition, the COPCs from the foodchain models were primarily metals, and potential risks from these contaminants were heavily mitigated by the factors discussed above.

9.0 DESCRIPTION OF ALTERNATIVES

The OU3 FS presented the results of the detailed analysis of seven potential remedial action alternatives. These alternatives were developed to provide a range of remedial actions for the site. This section of the ROD summarizes the seven alternatives described in the FS report, which include the following:

- Alternative 1 - No Action at Site 6 and Site 7.
- Alternative 2 - Institutional Controls at Site 6 and Site 7.
- Alternative 3 - In-Situ Fixation/Solidification of Surface Soils at Site 7, and Institutional Controls at Site 6 and Site 7.
- Alternative 4 - Excavation and Offsite Disposal of Surface Soils at Site 7, and Institutional Controls at Site 6 and Site 7.
- Alternative 5 - Excavation, Onsite Ex-Situ Fixation/Solidification, and Reuse of Surface Soils as Fill at Site 7, and Institutional Controls at Site 6 and Site 7.
- Alternative 6 - Soil Cover at Site 7 and Institutional Controls at Site 6 and Site 7.
- Alternative 7 - Partial Dewatering at Site 7, Excavation and Offsite Disposal of Surface/Subsurface Soils at Site 7, and Institutional Controls at Site 6 and Site 7.

The remedial action alternatives were developed to address contaminated groundwater and soil and various areas of concern within OU3. These areas of concern were identified by comparing media-specific contaminant concentrations detected at OU3 to media-specific remediation goals developed in the FS. The areas of concern identified for OU3 include:

- Contaminated soil at concentrations above performance standards (risk-based levels).
- Contaminated groundwater at concentrations above performance standards (state groundwater standards and MCLs).

Performance standards are defined in Section 11.0.

Figures 9-1 and ***9-2*** indicate the estimated areas of soil contamination at Site 7 for the residential scenario and the construction scenario, respectively. The estimated areas under the 30-year residential scenario and the 6-year residential scenario are identical because the RGOs are similar. ***Figure 9-3*** shows surficial aquifer well locations where contaminant concentrations exceeded state groundwater standards. The state standard is equal to or less than the MCL for all chemicals detected. Only one location at Site 6 had soil contaminant concentrations that exceeded the RGO for the hypothetical residential scenario. In addition, the arsenic concentration in the soil at Site 6 used for the risk assessment was the maximum concentration detected, and all other detections were within the range of background concentrations. Therefore, the risks presented by the ingestion of soil at Site 6 may be overly conservative, and the soil at Site 6 is not considered a medium of concern. ***Table 9-1*** summarizes the remedial objectives for soil and groundwater. A concise description of how each alternative will address contamination at OU3 and the estimated cost follows.

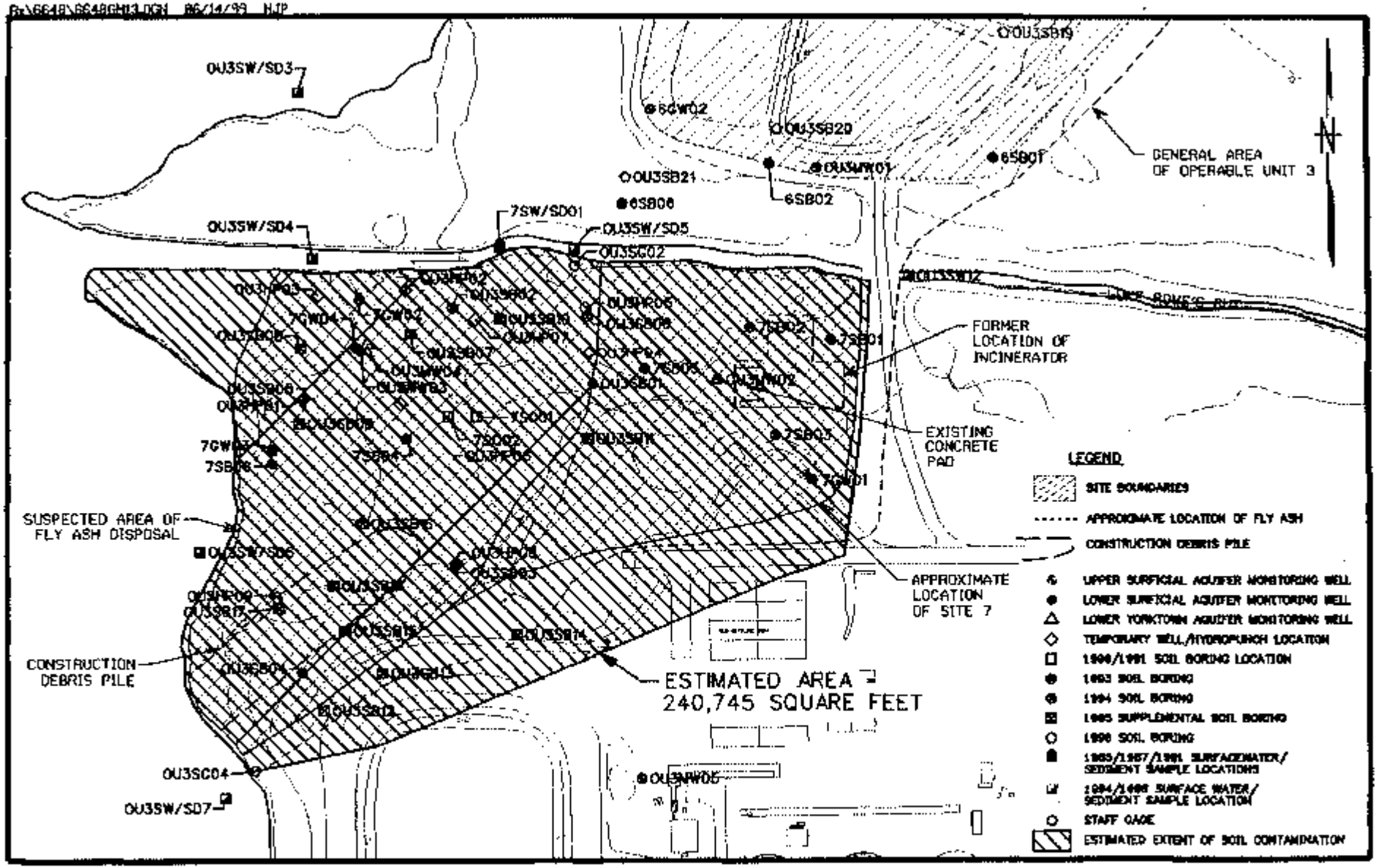
9.1 ALTERNATIVE 1 - NO ACTION AT SITE 6 AND SITE 7

The no action alternative is required under CERCLA to establish a baseline for comparison. Under this alternative, no actions will be performed to contain, remove, or treat soil or groundwater contaminated at concentrations above performance standards. No capital or annual operation and maintenance (O&M) costs are associated with this alternative.

9.2 ALTERNATIVE 2 - INSTITUTIONAL CONTROLS AT SITE 6 AND SITE 7

Under Alternative 2, institutional controls would be imposed to eliminate or reduce pathways of exposure to soil and groundwater contaminants at Sites 6 and 7 and waste/fill material at Site 7. In addition, a monitoring program would be implemented.

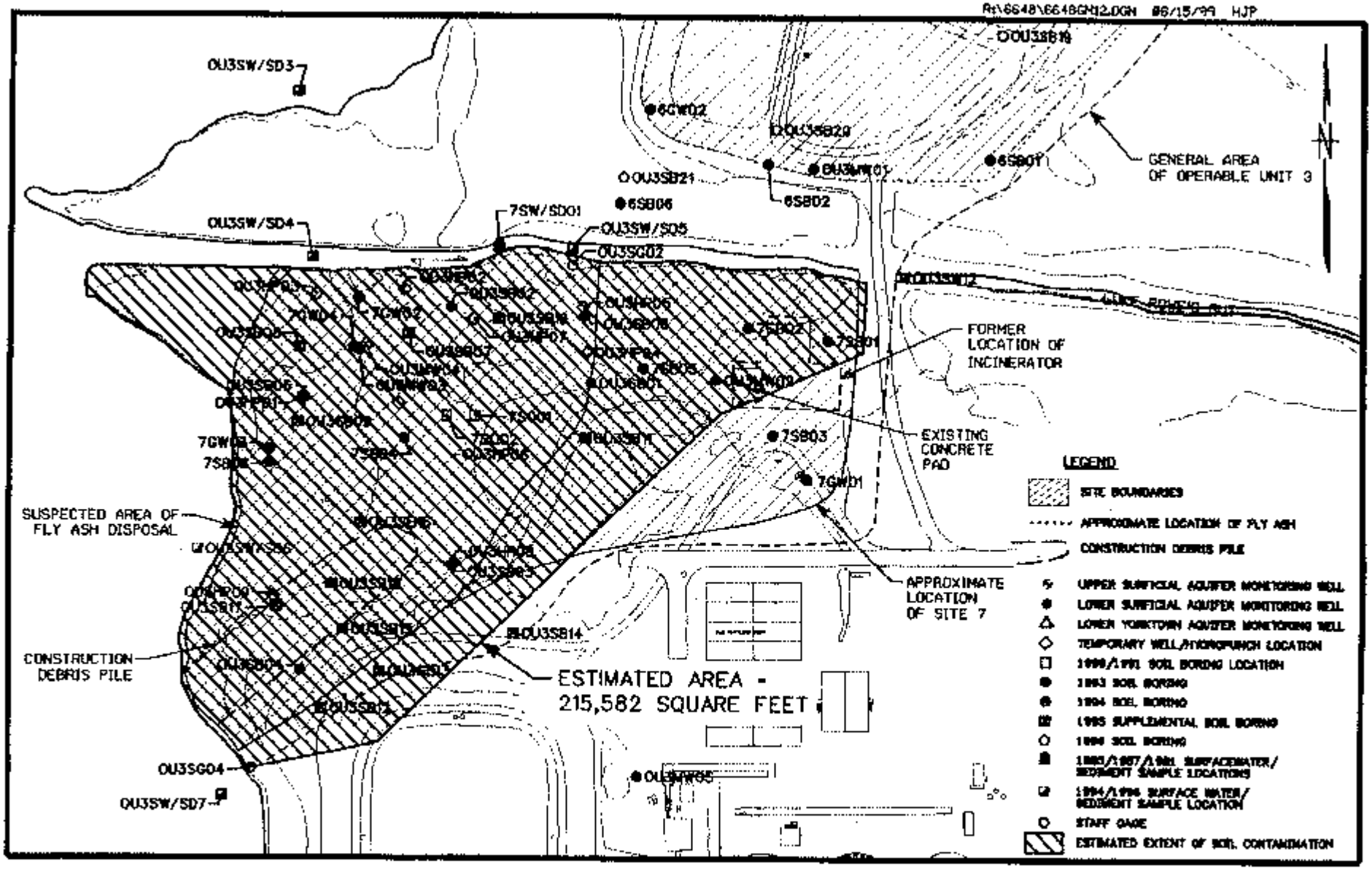
The institutional controls would involve land use, groundwater, and aquifer use restrictions and designation of the area as a restricted or limited use industrial area. The land use at Site 6 and the eastern portion of Site 7 would be restricted to industrial uses only. Prohibited land uses include, but would not be limited to, residences, schools, playgrounds, day care centers, and retirement centers. No intrusive activities (e.g., excavation of ground surface or insertion of objects into the ground surface, except for monitoring purposes) would be allowed at Site 7 unless prior approval has been obtained from USEPA and NCDENR. The land at the western portion of Site 7 would be restricted from any use other than for monitoring purposes. No wells would be installed except for monitoring wells constructed pursuant to 15A NCAC 2C.0108 as determined by NCDENR.



ESTIMATED EXTENT OF SOIL CONTAMINATION (RESIDENTIAL RISK SCENARIO), SITE 7, OU3
MCAS CHERRY POINT, NORTH CAROLINA

FIGURE 9-1

Tetra Tech NUS, Inc.



ESTIMATED EXTENT OF SOIL CONTAMINATION (CONSTRUCTION WORKER RISK SCENARIO), SITE 7, OU3
MCAS CHERY POINT, NORTH CAROLINA

FIGURE 9-2

Tetra Tech NUS, Inc.

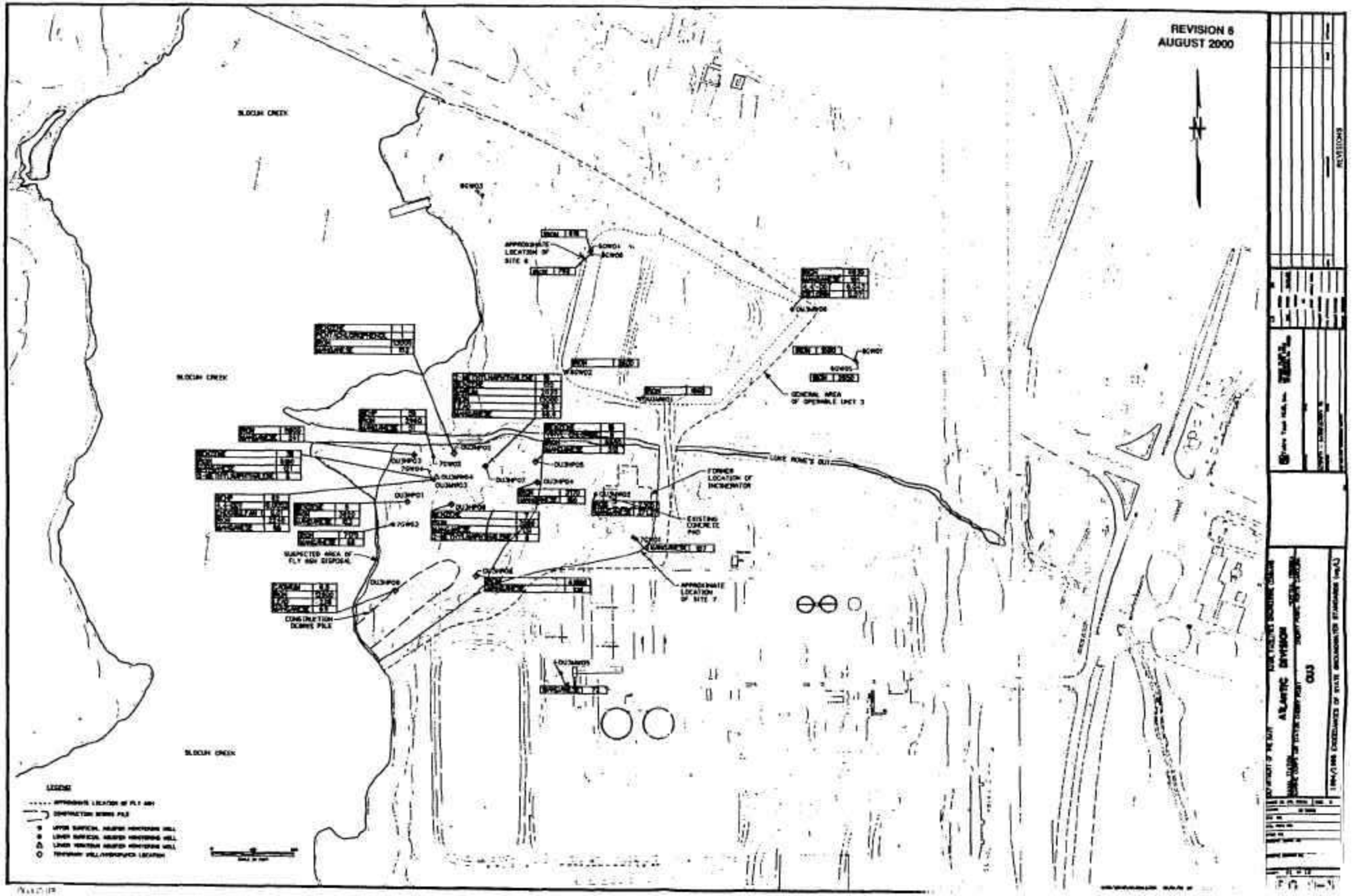

REVISION 6
AUGUST 2000
SLOCUM CREEK
SLOCUM CREEK
SLOCUM CREEK
APPROXIMATE LOCATION OF SITE 6
GENERAL AREA OF OPERABLE UNIT 3
LAKE ROWE'S OUT
FORMER LOCATION OF INCINERATOR
EXISTING CONCRETE PAD
APPROXIMATE LOCATION OF SITE 7
SUSPECTED AREA OF FLY ASH DISPOSAL
CONSTRUCTION DEBRIS PILE
LEGEND
ATLANTIC DIVISION
OU3

TABLE 9-1

REMEDIAL ACTION OBJECTIVES
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Objective	Location	Estimated Volume	Rationale
Protect future resident from exposure to waste/fill material and contaminated soil.	All of Site 7	17,800 CY	Benzo(a)pyrene and metals above risk levels.
Protect future construction worker from exposure to waste/fill material and contaminated soil.	Most of Site 7	39,900 CY	Metals above risk levels.
Protect future resident from exposure to contaminated groundwater (surficial aquifer).	All of Sites 6 and 7		Organics and metals above performance standards.

cy - cubic yards

Monitoring would consist of sampling of groundwater and surface water and sediment in Slocum Creek and Luke Rowe's Gut. The objective of monitoring would be to determine the effectiveness of the remedy and to confirm that contaminants are not migrating to groundwater or surface water.

The estimated net present worth of this alternative is $470,000 over 30 years, with a capital cost of $27,000 and an annual O&M cost of $22,000 per year.

9.3 ALTERNATIVE 3 - IN-SITU FIXATION/SOLIDIFICATION OF SURFACE SOILS AT SITE 7 AND INSTITUTIONAL CONTROLS AT SITE 6 AND SITE 7

The area delineated in the FS as exceeding RGOs for a residential land use scenario would be addressed in this alternative. Waste/fill and metals contaminated surface soils over an area of approximately 241,000 square feet and 2 feet deep (approximately 18,000 cubic yards) at Site 7 would be mixed in-place with water and fixating/solidifying agents such as time or portland cement. After approximately 10 days of curing, the hardened, soil-lime or soil-cement mixture would be covered with a layer of topsoil and then seeded. Because of potential volume increases in the mixed soil, a rip-rap layer may be used for slope stability.

The soil solidification process will minimize the mobility of the metals within the soil matrix and the leachability of the metals from the soil into the groundwater or surface water. The soil cap would eliminate direct exposure pathways between the metal contaminants in the surface soil, especially lead, and human or ecological receptors. With the direct exposure pathways eliminated, future use of the land at Site 7 could include residential and industrial uses. Site 6 would still be restricted to non-residential uses.

This alternative would also include all of the institutional controls detailed in Alternative 2, except that the fence and warning signs would not be required for the western portion of Site 7. In addition, the land use restrictions at Site 7 would be limited to prohibiting intrusive activities (no excavation of surface or subsurface soils) at the entire site.

The estimated time to implement this alternative is 6 months. The estimated net present worth of this alternative is $2.8 million over 30 years, with a capital cost of $2.34 million and an annual O&M cost of $22,000 per year.

9.4 ALTERNATIVE 4 - EXCAVATION AND OFFSITE DISPOSAL OF SURFACE SOILS AT SITE 7 AND INSTITUTIONAL CONTROLS AT SITE 6 AND SITE 7

Under Alternative 4, approximately 18,000 cubic yards of waste/fill materials and metals-contaminated surface soils at Site 7 (the same area as outlined in Alternative 3) would be excavated and would be disposed of off site at a nonhazardous waste landfill. Approximately 18,000 cubic yards of clean fill would

be placed and compacted in the excavated area. A 1-foot topsoil layer would be placed on top of the compacted fill, and the topsoil would be seeded.

Exposure of human and ecological receptors to waste/fill materials and to metals contamination in the surface soil at Site 7 would be eliminated by offsite disposal of the excavated surface materials.

This alternative would also include all of the institutional controls detailed in Alternative 2, except that the fencing and warning signs would not be required. Land use restrictions at Site 7 would be limited to prohibiting intrusive activities (no excavation of surface or subsurface soils) at the entire site.

The estimated time to implement this alternative is 6 months. The estimated net present worth of this alternative is $7.3 million over 30 years, with a capital cost of $6.8 million and an annual O&M cost of $22,000 per year.

9.5 ALTERNATIVE 5 - EXCAVATION, ONSITE EX-SITU FIXATION/SOLIDIFICATION AND REUSE OF SURFACE SOILS AS FILL AT SITE 7 AND INSTITUTIONAL CONTROLS AT SITE 6 AND SITE 7

Under Alternative 5, approximately 18,000 cubic yards of waste/fill and metals-contaminated surface soil (the same area as outlined in Alternatives 3 and 4) would be excavated from Site 7 and mixed with water and fixating/solidifying agents such as lime or portland cement. The soil/solidifying agent mixture would be backfilled into the excavated area and allowed to cure. After approximately 10 days of curing, the hardened, soil-lime or soil-cement mixture would be compacted and covered with a 1 foot layer of topsoil and seeded. Because of potential volume increases in the mixed soil, a rip-rap layer may be used for slope stability.

As with Alternative 3, the soil solidification process will minimize the mobility of the metals within the soil matrix and the leachability of the metals from the soil into the groundwater or surface water. The soil cap would eliminate direct exposure pathways between the metals in the surface soil, especially lead, and human or ecological receptors. With the direct exposure pathways eliminated, future use of the land at Site 7 could include residential and industrial uses. Site 6 would still be restricted to non-residential uses.

This alternative would also include all of the institutional controls detailed in Alternative 2, except that the fence and warning signs would not be required for the western portion of Site 7. In addition, the land use restrictions at Site 7 would be limited to prohibiting intrusive activities (no excavation of surface or subsurface soils) at the entire site.

The estimated time to implement this alternative is 9 months. The estimated net present worth of this alternative is $4.3 million over 30 years, with a capital cost of $3.8 million and an annual O&M cost of $22,000 per year.

9.6 ALTERNATIVE 6 - SOIL COVER AT SITE 7 AND INSTITUTIONAL CONTROLS AT SITE 6 AND SITE 7

Under Alternative 6, approximately 241,000 square feet of waste/fill and metals-contaminated surface soil at Site 7 (the same area as outlined in the previous alternatives) would be covered with a 2-foot layer of clean fill, which would be compacted. A 1-foot layer of top soil would be placed on top of the compacted fill and seeded.

The soil cap would eliminate direct exposure pathways between the metals in the surface soil, especially lead, and human or ecological receptors. With the direct exposure pathways eliminated, future use of the land at Site 7 could include residential and industrial uses. Site 6 would still be restricted to non-residential uses.

This alternative would also include all of the institutional controls detailed in Alternative 2 except that the fence and warning signs would not be required for the western portion of Site 7. In addition, the land use restrictions at Site 7 would be limited to prohibiting intrusive activities (no excavation of surface or subsurface soils) at the entire site.

The estimated time to implement this alternative is 6 months. The estimated net present worth of this alternative is $2.6 million over 30 years, with a capital cost of $2.2 million and an annual O&M cost of $22,000 per year.

9.7 ALTERNATIVE 7 - PARTIAL DEWATERING AT SITE 7, EXCAVATION AND OFFSITE DISPOSAL OF SURFACE/SUBSURFACE SOILS AT SITE 7, AND INSTITUTIONAL CONTROLS AT SITE 6 AND SITE 7

Waste/fill and metals-contaminated soils over an area approximately 241,000 square feet and 5 feet deep (approximately 45,000 cubic yards) would be excavated to eliminate the sources of groundwater contamination. The excavated waste/fill and contaminated soil would be disposed of off site at a nonhazardous waste landfill. Approximately 45,000 cubic yards of clean fill would be placed, compacted, and seeded in the excavated area.

In order to excavate the soil to a depth of 5 feet, the groundwater table will need to be lowered below that level. A 2,200-foot-long slurry wall extending approximately 30 feet to the confining layer would be

constructed around the boundary of Site 7. The groundwater within the slurry wall would then be pumped at a rate sufficient to lower the water table below the bottom of the excavation. Because the groundwater being removed would be contaminated with metals and VOCs, the groundwater would be treated at the Air Station's Industrial Wastewater Treatment Plant prior to discharge.

Because this alternative does not address the contamination at Site 6 or the entire volume of contaminated groundwater at Site 7, this alternative would also include all of the institutional controls detailed in Alternative 2, except that the fencing and warning signs at Site 7 would not be required. Land use restrictions at Site 7 would be limited to prohibiting intrusive activities (no excavation of surface or subsurface soils) at the entire site.

The estimated time to implement this alternative is 18 months. The estimated net present worth of this alternative is $16.5 million over 30 years, with a capital cost of $16.5 million and an annual O&M cost of $22,000 per year.

9.8 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

The remedial action for OU3, under CERCLA Section 121(d), must comply with federal and state environmental laws that are either applicable or relevant and appropriate. Applicable requirements are those standards, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Relevant and appropriate requirements are those that, while not applicable, still address problems or situations sufficiently similar to those encountered on site that their use is well-suited to a particular site. To-be-considered (TBC) criteria are nonpromulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary level of cleanup to protect health or the environment. While TBCs do not have the status of ARARs, the approach to determining whether a remedial action is protective of human health and the environment involves considering TBCs along with ARARs.

The affected groundwater in the aquifers beneath OU3 has been classified by North Carolina and USEPA and Class GA and Class 2A, respectively, a potential source of drinking water. It is the policy of North Carolina and USEPA that groundwater resources be protected and restored to their beneficial uses. North Carolina groundwater classification is defined in 15A NCAC 2L. A complete definition of the USEPA groundwater classification is provided in the Guidelines for Groundwater Classification under the EPA Groundwater Protection Strategy, Final Draft, December 1986.

The site has a source of groundwater contamination that must be addressed in order to use monitored natural attenuation as the selected remedy for groundwater. One hot spot has been identified as a potential

source of groundwater contamination. If other sources are identified during the course of the monitored natural attenuation, they will be addressed in a manner that satisfies the state ARAR, 15A NCAC 2L.0106(f)(3) and (f)(4).

Contaminant-specific ARARs are health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment. Examples of chemical-specific ARARs include the MCLs specified under the Safe Drinking Water Act and North Carolina groundwater standards. Because numerous COCs are usually identified for any remedial site, various numerical quantity requirements can be ARARs. ***Table 9-2*** lists potential contaminant-specific ARARs for OU3.

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are in specific locations. Examples of location-specific ARARs include state and federal requirements to protect floodplains, critical habitats, and wetlands and solid and hazardous waste facility siting criteria. ***Table 9-3*** summarizes the potential location-specific ARARs for OU3.

Action-specific ARARs are technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements are triggered by the particular remedial activities that are selected to accomplish a remedy. Because several alternative actions may be implemented for any remedial site, very different requirements can be ARARs. ***Table 9-4*** lists potential action-specific ARARs and TBCs for OU3.

TABLE 9-2

POTENTIAL CONTAMINANT-SPECIFIC ARARs
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Citation	Description	Category
Safe Drinking Water Act		
40 CFR 141 - National Primary Drinking Water Standards	Establishes MCLs, which are health-based standards for public water systems.	R&A
	Establishes Maximum Contaminant Level Goals (MCLGs) set at levels producing no known or anticipated adverse health effects.	R&A
Clean Water Act		
40 CFR 131 - Ambient Water Quality Standards	Establishes ambient standards for the protection of human health and aquatic life.	R&A
Clean Water Act		
40 CFR 50 - National Primary and Secondary Ambient Air Quality Standards	Establishes standards for ambient air quality to protect public health.	R&A
Resource Conservation and Recovery Act		
40 CFR 264, Subpart F - Releases from Solid Waste Management Units	Establishes groundwater protection standards.	A
State of North Carolina Regulations		
15A NCAC 2D .0400 - Ambient Air Quality Standards	Establishes standards for ambient air quality to protect human health.	R&A
15A NCAC 2B - Surface Water Classifications and Standards	Establishes water quality standards for all waters of the state	A
15A NCAC 2L - Groundwater Quality Standards	Establishes minimum water quality standards for groundwater.	A
15A NCAC 18 - Water Quality Standards	Establishes MCLs for drinking water.	R&A
(Draft) North Carolina Risk Analysis Framework	Establishes cleanup levels for contaminants in soil and groundwater.	TBC

A - Applicable
R&A - Relevant and appropriate
TBC - To-be-considered criteria

TABLE 9-3

POTENTIAL LOCATION-SPECIFIC ARARs
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Citation	Description	Category
Executive Order 11990 Wetlands Protection Policy	Requires federal agencies to take action to minimize the destruction, loss, or degradation of wetlands and to enhance their natural and beneficial values. Wetlands are located along Slocum Creek and Luke Rowe's Gut.	TBC
Endangered Species Act (16 USC 1531/40 CFR 502)	Requires federal agencies to ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or adversely affect its critical habitat.	R&A
Fish and Wildlife Coordination Act (16 USC 661)	Requires federal agencies to consult with appropriate state agency for the modification of any body of water.	R&A
Fish and Wildlife Improvement Act (16 USC 742a) and Fish and Wildlife Conservation Act (16 USC 2901)	Provide for consideration of the impacts on wetlands and protected habitats. Wetlands are located along Slocum Creek and Luke Rowe's Gut.	R&A
EPA Groundwater Protection Strategy	Provides for the protection of groundwater for its highest usage.	TBC
North Carolina Coastal Area Management Act (15A NCAC 7)	Provides guidelines for areas of environmental concern, including estuarine waters and estuarine shorelines.	R&A

R&A - Relevant and appropriate
TBC - To-be-considered criteria

TABLE 9-4

POTENTIAL ACTION-SPECIFIC ARARs
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 2

Citation	Description	Category
Resource Conservation and Recovery Act		
40 CFR 261 - Identification and Listing of Hazardous Wastes	Contains requirements for characterization of hazardous wastes	R&A
40 CFR 262 - Standards Applicable to Generators of Hazardous Waste	Establishes general requirements for managing and manifesting hazardous wastes.	R&A
40 CFR 263 - Standards Applicable to Transporters of Hazardous Waste	Establishes requirements for offsite transport of hazardous waste.	R&A
40 CFR 264 - Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	Establishes minimum national standards that define acceptable management of hazardous wastes.	R&A
40 CFR 268 - Land Disposal Restrictions	Prohibits certain classes of hazardous waste from land disposal without acceptable treatment.	R&A
Clean Water Act		
40 CFR 122 - National Pollutant Discharge Elimination System	Governs point-source discharges to surface water.	R&A
Other Federal Acts and Requirements		
49 CFR 107 and 171-179 - Department of Transportation Rules for Hazardous Materials Transport	Regulates the offsite transport of hazardous materials (including hazardous and solid waste).	A
29 CFR 1910, 1926, 1904 - Occupational Safety and Health Administration	Regulates occupational safety and health requirements for workers engaged in remedial activities.	A
State of North Carolina Regulations		
15A NCAC 13A - Solid Waste Management Regulations	Establishes standards for management of solid (nonhazardous) waste.	A
15A NCAC 13B - Hazardous Waste Management Regulations	Establishes standards for management of hazardous waste.	R&A
15A NCAC 2B and 2H - Water Pollution Control Regulations	Regulates wastewaters discharged to surface water.	A
15A NCAC 2H - Storm Water Runoff Disposal	Regulates pollutants associated with storm water runoff.	A
15A NCAC 4 - Erosion and Sedimentation Control	Establishes standards to control damage from land-disturbing activities.	A

TABLE 9-4

POTENTIAL ACTION-SPECIFIC ARARs
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 2

Citation	Description	Category
15A NCAC 2C - Well Construction Standards	Establishes criteria for design and installation of monitoring wells.	A
15A NCAC 2L.0106 - Corrective Action for Groundwater	Establishes requirements for corrective action when groundwater has been degraded.	A
NCGS 130A – 310.8 – Recordation of Inactive Hazardous Substance or Waste Disposal Site	Establishes requirements for filing notice of site with County Register of Deeds Office	A

A - Applicable
R&A - Relevant and appropriate
TBC - To-be-considered criteria

10.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

This section of the ROD provides the basis for determining which alternative provides the best balance with respect to the statutory balancing criteria in CERCLA Section 121 (42 USC 9621) and in the NCP (40 CFR 300.430). The major objective of the FS was to develop, screen, and evaluate alternatives for remediation of groundwater and soil at OU3. A variety of technologies and alternatives were identified as candidates to remediate contamination at OU3. These technologies and alternatives were screened based on their feasibility with respect to the contaminants present and site characteristics. After the initial screening, the remaining alternatives and technologies were combined into potential remedial alternatives and evaluated in detail. The remedial alternative was selected from the screening process based on the following nine evaluation criteria:

- Overall protection of human health and the environment
- Compliance with applicable or relevant and appropriate federal and state public health and environmental standards
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost
- USEPA and state acceptance
- Community acceptance

The evaluation criteria are defined in ***Table 10-1***.

The NCP categorizes the nine criteria into three groups:

- Threshold Criteria - Overall protection of human health and the environment and compliance with ARARs (or providing grounds for invoking a waiver) are threshold criteria that must be satisfied in order for an alternative to be eligible for selection.

- Primary Balancing Criteria - Long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost are primary balancing factors used to weigh major trade-offs among alternative hazardous waste management strategies.

TABLE 10-1

GLOSSARY OF EVALUATION CRITERIA

- **Overall Protection of Human Health and Environment** - Addresses whether an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- **Compliance with ARARs** - Addresses whether an alternative will meet all of the applicable or relevant and appropriate requirements (ARARs), other criteria to be considered (TBCs), or other federal and state environmental statutes or provides grounds for invoking a waiver.

- **Long-term Effectiveness and Permanence** - Refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

- **Reduction of Toxicity, Mobility, or Volume through Treatment** - Addresses the anticipated performance of the treatment options that may be employed for an alternative.

- **Short-term Effectiveness** - Refers to the speed with which the alternative achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.

- **Implementability** - Addresses the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement the chosen solution.

- **Cost** - Includes capital and operation and maintenance costs. For comparative purposes, provides present-worth values.

- **USEPA and State Acceptance** - Evaluates the technical and administrative issues and concerns that the USEPA and the State of North Carolina have regarding each of the alternatives. This criterion is addressed in the ROD once comments on the RI/FS report and the Proposed Plan have been received.

- **Community Acceptance** - Evaluates the issues and concerns the public may have regarding each of the alternatives. This criterion is addressed in the ROD once comments on the RI/FS report and Proposed Plan have been received.

- Modifying Criteria – USEPA, state, and community acceptance are modifying criteria that are formally taken into account after public comments are received on the proposed plan and incorporated in the ROD.

The selected alternative must meet the threshold criteria, including complying with all ARARs or be granted a waiver for compliance with ARARs. Any alternative that does not satisfy both of these requirements is not eligible for selection. The primary balancing criteria are the technical criteria upon which the detailed analysis of alternatives is primarily based. The final two criteria, known as modifying criteria, assess the acceptance of the alternative. The following analysis summarizes the evaluation of alternatives for remediating groundwater and soil at OU3 under each criterion. Each alternative is compared for achievement of a specific criterion.

Table 10-2 summarizes the detailed analysis.

10.1 THRESHOLD CRITERIA

All alternatives considered for selection must comply with the threshold criteria of overall protection of human health and the environment and compliance with ARARs.

10.1.1 Overall Protection of Human Health and the Environment

This criterion evaluates, overall, the degree of protectiveness afforded to human health and the environment. It assess the overall adequacy of each alternative.

Soil concentrations at Site 7 pose an unacceptable risk to human health under a hypothetical future residential exposure scenario and under a future construction worker scenario. Groundwater concentrations exceed state standards and pose an unacceptable risk to human health from ingestion under a hypothetical future residential exposure scenario.

Alternative 1 does not reduce potential risks to human health and the environment; therefore, this alternative is not protective and is not further considered in the discussion.

Alternatives 2 through 7 would employ institutional controls, with monitoring, to reduce the unacceptable risks to human health from ingestion of groundwater and exposure to contaminated soil. The sampling and analysis program would confirm that contaminants are not migrating to the environment, and institutional controls would restrict land use and groundwater use and limit site access. These

TABLE 10-2

**SUMMARY OF EVALUATION OF ALTERNATIVES
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 1 OF 6**

Evaluation Criteria	Alternative 1: No Action at Site 6 and Site 7	Alternative 2: Institutional Controls at Sites 6 and 7	Alternative 3: In-situ Fixation/Solidification of Surface Soils at Site 7; Institutional Controls at Sites 6 and 7	Alternative 4: Excavation and Offsite Disposal of Surface Soils at Site 7; Institutional Controls at Sites 6 and 7
Threshold Criteria				
Overall Protection of Human Health and Environment	No reduction in potential risks.	Would prevent unacceptable risks to human health by eliminating exposure.	Institutional controls and monitoring would provide protection of human health. Fixation/solidification would reduce potential exposure for humans and protect the environment.	Institutional controls and monitoring would provide protection of human health. Excavation would remove source of potential health hazards and environmental risks.
Compliance with ARARs Chemical-Specific ARARs	No active effort to reduce contaminant levels to attain ARARs.	Would comply with state groundwater regulations if one soil “hot spot” is controlled.	Would comply with human health standards for soil and state groundwater regulations.	Would comply with human health standards for soil and state groundwater regulations.
Location-Specific ARARs	Not applicable.	Not applicable.	Could be designed to attain ARARs that apply.	Could be designed to attain ARARs that apply.
Action-Specific ARARs	Not applicable.	Not applicable.	Could be designed to attain ARARs that apply.	Could be designed to attain ARARs that apply.
Primary Balancing Criteria				
Long-term Effectiveness and Performance	Would allow risk to remain uncontrolled.	Monitoring and use restrictions would provide adequate and reliable controls.	Treatment of contaminated soil would reduce risks to potential land users and the environment. Institutional controls would further limit risks. Treatment, monitoring, and use restrictions would provide adequate and reliable controls.	Removal of contaminant source would reduce risks to potential land users and the environment. Institutional controls would further limit risks. Removal, monitoring, and use restrictions would provide adequate and reliable controls.

TABLE 10-2

**SUMMARY OF EVALUATION OF ALTERNATIVES
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 2 OF 6**

Evaluation Criteria	Alternative 1: No Action at Site 6 and Site 7	Alternative 2: Institutional Controls at Sites 6 and 7	Alternative 3: In-situ Fixation/Solidification of Surface Soils at Site 7; Institutional Controls at Sites 6 and 7	Alternative 4: Excavation and Offsite Disposal of Surface Soils at Site 7; Institutional Controls at Sites 6 and 7
Reduction of Toxicity, Mobility, or Volume through Treatment	No treatment.	No treatment.	The mobility of soil contaminants would be reduced. Although the toxicity and volume of contaminants would be unaffected, this alternative will result in an increase in the total volume of material to be handled.	No treatment.
Short-term Effectiveness	Not applicable. No short-term impacts or concerns at site.	Proper system management would limit short term hazards associated with institutional controls. Less than 1 year to implement.	Proper system management would limit short term hazards associated with contaminated media treatment. Less than 1 year to implement.	Proper system management would limit short term hazards associated with contaminated media treatment. Less than 1 year to implement.
Implementability	Nothing to implement. No monitoring to show effectiveness.	Enforcement of institutional controls at military site is proven to be effective and reliable. Monitoring would demonstrate effectiveness.	Enforcement of institutional controls at military site is proven to be effective and reliable. Treatability studies will be necessary to confirm adequate fixation/solidification can be achieved. Monitoring will demonstrate effectiveness.	Enforcement of institutional controls at military site is proven to be effective and reliable. Surface soil would need testing for acceptance at offsite disposal facility. Alternative consists of common remediation practices, which are readily available and implementable. Monitoring would demonstrate effectiveness.
Costs:				
Capital	$0	$27,000	$2,340,000	$6,800,000
O&M	$0	$22,000 ($62,000 every fifth year due to site review)	$22,000 ($62,000 every fifth year due to site review)	$22,000 ($62,000 every fifth year due to site review)
Net Present Worth	$0	$470,000	$2,800,000	$7,300,000

TABLE 10-2

**SUMMARY OF EVALUATION OF ALTERNATIVES
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 3 OF 6**

Evaluation Criteria	Alternative 1: No Action at Site 6 and Site 7	Alternative 2: Institutional Controls at Sites 6 and 7	Alternative 3: In-situ Fixation/Solidification of Surface Soils at Site 7; Institutional Controls at Sites 6 and 7	Alternative 4: Excavation and Offsite Disposal of Surface Soils at Site 7; Institutional Controls at Sites 6 and 7
Modifying Criteria				
USEPA and State Acceptance	Not acceptable to USEPA and NCDENR.	Not completely acceptable to NCDENR.	Not completely acceptable to NCDENR.	Not completely acceptable to NCDENR.
Community Acceptance	See Section 10.3.2	See Section 10.3.2	See Section 10.3.2	See Section 10.3.2

TABLE 10-2

**SUMMARY OF EVALUATION OF ALTERNATIVES
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 4 OF 6**

Evaluation Criteria	Alternative 5: Excavation, Onsite, Ex-Situ Fixation/Solidification, and Reuse of Surface Soils as Fill at Site 7; Institutional Controls at Sites 6 and 7	Alternative 6: Soil Cover at Site 7; Institutional Controls at Sites 6 and 7	Alternative 7: Partial Dewatering at Site 7; Excavation and Offsite Disposal of Surface/Subsurface Soil at Site 7; Institutional Controls at Sites 6 and 7
Threshold Criteria			
Overall Protection of Human Health and Environment	Institutional controls and monitoring would provide protection of human health and the environment. Fixation/solidification would reduce potential exposure for humans and provide protection for the environment.	Institutional controls and monitoring would provide protection of human health and the environment. Future land users would be protected from exposure to the contamination by the soil cover. The cover would also add a level of protection to the environment by reducing contaminant migration.	Institutional controls and monitoring would provide protection of human health and the environment. Excavation would remove source of potential health hazards and environmental risks.
Compliance with ARARs Chemical-Specific ARARs Location-Specific ARARs Action-Specific ARARs	Would comply with human health standards for soil and state groundwater regulations. Could be designed to attain ARARs that apply. Could be designed to attain ARARs that apply.	Would comply with human health standards for soil and state groundwater regulations. Could be designed to attain ARARs that apply. Could be designed to attain ARARs that apply.	Would comply with human health standards for soil and state groundwater regulations. Could be designed to attain ARARs that apply. Could be designed to attain ARARs that apply.
Primary Balancing Criteria			
Long-term Effectiveness and Performance	Treatment of contaminated soil would reduce risks to potential land users and the environment. Institutional controls would further limit risks. Treatment, monitoring, and use restrictions would provide adequate and reliable controls.	Soil cover would reduce risks to potential land users and the environment. Institutional controls would further limit risks. Containment, monitoring, and use restrictions would provide adequate and reliable controls.	Removal of contaminated surface and subsurface soil would reduce risks to potential land users and the environment. Institutional controls would further limit risks. Removal, monitoring, and use restrictions would provide adequate and reliable controls.

TABLE 10-2

**SUMMARY OF EVALUATION OF ALTERNATIVES
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
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Evaluation Criteria	Alternative 5: Excavation, Onsite, Ex-Situ Fixation/Solidification, and Reuse of Surface Soils as Fill at Site 7; Institutional Controls at Sites 6 and 7	Alternative 6: Soil Cover at Site 7; Institutional Controls at Sites 6 and 7	Alternative 7: Partial Dewatering at Site 7; Excavation and Offsite Disposal of Surface/Subsurface Soil at Site 7; Institutional Controls at Sites 6 and 7
Reduction of Toxicity, Mobility, or Volume through Treatment	The mobility of soil contaminants would be reduced. Although the toxicity and volume of contaminants would be unaffected, this alternative will result in an increase in the total volume of material to be handled.	No treatment.	Groundwater removed to allow soil excavation would be treated at the Air Station IWTP.
Short-term Effectiveness	Proper system management would limit short term hazards associated with contaminated media treatment and potential exposure to workers during alternate implementation. Less than 1 year to implement.	Proper system management would limit short term hazards associated with contaminated media handling and potential exposure to workers during alternate implementation. Less than 1 year to implement.	Proper system management would limit short term hazards associated with contaminated media handling. Eighteen months to implement.
Implementability	Enforcement of institutional controls at military site is proven to be effective and reliable. Treatability studies would be necessary to confirm adequate fixation/solidification can be achieved. Monitoring will demonstrate effectiveness.	Enforcement of institutional controls at military site is proven to be effective and reliable. Alternative consists of common remediation practices, which are readily available and implementable. Monitoring would demonstrate effectiveness.	Enforcement of institutional controls at military site is proven to be effective and reliable. Soil would need testing for acceptance at offsite disposal facility. Alternative consists of common remediation practices, which are readily available and implementable. Monitoring would demonstrate effectiveness.
Costs			
Capital	$3,800,000	$2,200,000	$16,500,000
O&M	$22,000 ($62,000 every fifth year due to site review)	$22,000 ($62,000 every fifth year due to site review)	$22,000 ($62,000 every fifth year due to site review)
Net Present Worth	$4,300,000	$2,600,000	$16,500,000

TABLE 10-2

**SUMMARY OF EVALUATION OF ALTERNATIVES
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA
PAGE 6 OF 6**

Evaluation Criteria	Alternative 5: Excavation, Onsite, Ex-Situ Fixation/Solidification, and Reuse of Surface Soils as Fill at Site 7; Institutional Controls at Sites 6 and 7	Alternative 6: Soil Cover at Site 7; Institutional Controls at Sites 6 and 7	Alternative 7: Partial Dewatering at Site 7; Excavation and Offsite Disposal of Surface/Subsurface Soil at Site 7; Institutional Controls at Sites 6 and 7
Modifying Criteria			
USEPA and State Acceptance	Not acceptable to USEPA and NCDENR.	Not completely acceptable to NCDENR.	Acceptable to NCDENR.
Community Acceptance	See Section 10.3.2	See Section 10.3.2	See Section 10.3.2

alternatives also rely on natural attenuation processes to reduce organic and inorganic contaminant concentrations that exceed state groundwater standards and pose an unacceptable risk to human health from ingestion.

Alternatives 3 and 5 use treatment to reduce the mobility of soil contaminants that could migrate to groundwater and surface water and reduce the potential for human exposure. Alternatives 4 and 7 would excavate the contaminated soil, thereby providing the best and most immediate protection of human health and the environment. Alternative 6 uses a soil cover to protect human health and the environment by reducing the potential for exposure to soil contaminants and reducing contaminant migration.

10.1.2 Compliance with ARARs and TBCs

Alternatives 3, 4, 5, 6, and 7 will meet all of their respective ARARs. Alternative 2 can meet ARARs if it is modified to address one soil "hot spot" that is a suspected source of groundwater contamination. Groundwater ARARs include North Carolina groundwater standards and MCLs that establish chemical-specific limits on certain contaminants in groundwater and community water systems, respectively. For Alternatives 2, 3, 4, 5, 6, and 7, remedial action would include further sampling and analysis of groundwater to ensure that groundwater beneath OU3 will meet ARARs through natural attenuation. Alternatives 2 through 7 would be able to meet all location- and action-specific ARARs identified in ***Tables 9-2*** and ***9-3***.

10.2 PRIMARY BALANCING CRITERIA

10.2.1 Long-Term Effectiveness and Permanence

The main concerns under this criterion are the reliability of controls over the residual risks associated with contaminants that remain at the site and the permanence of the effectiveness of each alternative. Until such time that no residual risk remains at the site, all alternatives will require 5-year reviews to ensure that adequate protection of human health and the environment is maintained.

Alternatives 4 and 7 are the most effective, because soil contaminants that exceed RGOs would be removed from OU3 and disposed of off site. Alternatives 3 and 5 are less effective than Alternatives 4 and 7; however, the potential for exposure and contaminant mobility would be reduced using solidification and a soil cover. Alternative 6 is less effective that Alternatives 3 and 5 because exposure and mobility are reduced using a soil cover. Alternative 2 is the least effective, because soil contamination would not be actively removed. Alternatives 2 through 7 provide continued monitoring, aquifer use restrictions, and land use restrictions, which are all adequate and reliable controls. The monitoring programs are used to determine that the alternatives remain effective.

Barring remediation of contamination to unrestricted exposure levels, any private ownership of the land in the future would be controlled under a restrictive covenant and such additional measures as may be needed to assure continued compliance with Land Use Controls on the transferred property.

10.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses reduction in toxicity, mobility, or volume of contaminants provided through treatment processes.

Alternatives 2, 4, 6, and 7 do not involve active treatment processes to reduce toxicity, mobility, or volume. Only Alternatives 3 and 5 provide for a reduction in mobility through treatment, but may result in increase volume.

10.2.3 Short-Term Effectiveness

The main concern for this criterion would be potential effects to the remedial workers, community, and environment during implementation of the remedial action. An additional concern is the time for each alternative to achieve the remedial action objectives (time until protection is achieved).

No risks to the community or environment are anticipated for any of the alternatives.

Alternatives 2 and 3 create risks to workers exposed to in-situ contaminants. Alternatives 4, 5, 6, and 7 also create risks to workers during excavation, handling, and treatment of contaminated soil. All potential risks to workers can be adequately controlled.

The institutional controls for all alternatives could be implemented in less than 1 year. Alternatives 3, 4, 5, and 6 could be implemented in less than 1 year. Alternative 7 could be implemented in 18 months. Consequently, all alternatives are essentially equal in terms of time until protection is achieve.

10.2.4 Implementability

The major concerns in this category consist of the ease of implementation, including availability of equipment and services, the technical complexity of the processes, and the ease of obtaining permits or approvals. All of the alternatives use conventional, well-demonstrated, and commercially available technologies that are reliable and readily implementable. Alternatives 3 and 5 present certain additional concerns because treatability studies would probably be required.

10.2.5 Cost

Cost details are provided in the FS and summarized in ***Table 10-3.***

10.3 MODIFYING CRITERIA

10.3.1 USEPA/State Acceptance

The USEPA and NCDENR have concurred with the selection of Alternative 2, with the modifications outlined in Sections 11 and 13, to remediate OU3.

10.3.2 Community Acceptance

No community comments were expressed at the August 22, 1996, public meeting. No written comments from the community were received during the public comment period. Based on comments expressed at the August 22, 1996, RAB meeting, it appears that the community generally agrees with the selected remedy. Specific responses to issues raised by the community are provided in Section 14, the Responsiveness Summary.

TABLE 10-3

COST COMPARISON FOR ALTERNATIVES
OPERABLE UNIT 3
MCAS CHERRY POINT, NORTH CAROLINA

Alternative	Direct and Indirect Costs	Annual O&M Costs	Total Net Present Worth
Alternative 1	None	None	None
Alternative 2[(1)]	$261,000	$52,000/$22,000[(2)]	$761,000
Alternative 3	$2,340,000	$22,000	$2,800,000
Alternative 4	$6,800,000	$22,000	$7,300,000
Alternative 5	$3,800,000	$22,000	$4,300,000
Alternative 6	$2,200,000	$22,000	$2,600,000
Alternative 7	$16,500,000	$22,000	$16,500,000

1) The costs associated with this alternative have been revised from those presented in the FS as a result of installing the air sparge system and as a result of placing the fence along all of Site 7 (see Section 13.0).

2) The annual O&M costs for the first two years ($52,000) include the operating costs for the air sparge system. The annual O&M costs for the next 28 years ($22,000) only include the costs for long-term monitoring and maintenance of the fence.

11.0 SELECTED REMEDY

11.1 REMEDY SELECTION

Based on the requirements of CERCLA, the NCP, the detailed analysis of alternatives, current and proposed exposure scenarios, and USEPA, state, and public comments, MCAS Cherry Point and the Navy have selected Alternative 2 (Institutional Controls at Site 6 and Site 7), with modifications noted here and outlined in Section 13, for remedial action at OU3. At the completion of this remedy, the risk associated with OU3 will be protective of human health and the environment.

The selected alternative for OU3 is consistent with the requirements of Section 121 of CERCLA and the NCP. Modifications to the selected alternative (in-situ treatment of an isolated "hotspot") will reduce the mobility, toxicity, and volume of contaminated soil on site. In addition, the selected alternative is protective of human health and the environment, will attain federal and state ARARs (unless a waiver is justified), is cost-effective, and uses permanent solutions to the maximum extent practicable.

Based on the information available at this time, the selected alternative, with the modifications noted here and described in Section 13, represents the best balance among the criteria used to evaluate remedies.

The preferred remedy is anticipated to meet the following objectives:

- Prevent potential exposure to contaminated soil and waste/fill material.
- Restrict current and future land use at OU3.
- Prevent exposure to contaminated groundwater at OU3.
- Prevent future potential use of the groundwater at OU3.
- Allow for natural attenuation of the groundwater at OU3.
- Mitigate migration of contaminants from the soil (secondary source area) to the environment.

The only unacceptable risks to human health are for the future hypothetical residential exposure (Sites 6 and 7) and future hypothetical construction worker (Site 7). Most of the risks are due to ingestion of surficial aquifer groundwater and ingestion of surface soil. In addition, lead is present in the soil at concentrations above recommended screening levels. All other potential risks to human health under the remaining current and future exposure scenarios are within the USEPA "acceptable" risk range. The future residential exposure pathway for groundwater is extremely unlikely because the surficial aquifer is not used as a source of drinking water, and the Air Station has a separate potable water supply system.

The major components of the selected remedy are described below:

- Monitored natural attenuation of groundwater contaminants will be the means of remediating the groundwater and detecting any future releases from the waste/fill materials. Long-term monitoring shall be used to confirm the effectiveness of the natural attenuation processes in attaining the performance standards in ***Table 11-1***.

- In-situ treatment using enhanced bioremediation will be implemented at an isolated soil "hot spot" (secondary source area) that is contaminated with fuel-related compounds. The hot spot is in the north-central portion of Site 7 as shown on ***Figure 11-1***. This includes sampling of soil to ensure that the performance standards are met. The performance standard for benzene is 5.6 µg/kg. This performance standard has been revised since the RI and FS were prepared. Consequently, the standard is different than the performance standard presented on page 8-26 of the ROD. Also note that based on a newly adopted state groundwater standard for 2-methylnaphthalene, the groundwater at OU3 no longer exceeds the groundwater standard for 2-methylnaphthalene. Therefore, soil containing 2-methylnaphthalene will no longer be considered as a secondary source of groundwater contamination.

- Institutional controls will be implemented at the site to limit possible exposure to contaminants and to protect human health and the environment. The details of the institutional controls for this ROD are presented in the Land Use Control Implementation Plan (LUCIP), Appendix B. Based on regulatory input, the institutional controls as outlined in the LUCIP have been modified from those presented in the FS and summarized in Section 9.2 of this ROD.

The records on the presence of contamination at OU3 and the specific restrictions for site use listed above (including land use and groundwater use restrictions) will be recorded in the MCAS Cherry Point Base Master Plan. This will insure that at the time of future land development, the Air Station will be able to take adequate measures to minimize adverse human health and environmental effects. USEPA and NCDENR will be properly notified of proposed construction plans at OU3 before any construction activities begin. Barring remediation to unrestricted exposure levels, private ownership of the land in the future would be controlled under a restrictive covenant, and such additional measures as may be needed to assure continued compliance with Land Use Controls on the transferred property.

The fencing and warning signs will be installed to restrict access to Site 7, thereby minimizing human exposure to contaminated media (soil with lead at concentrations above 1,300 mg/kg) (approximately

260,000 square feet). The warning signs will be installed along the fence, along the banks of Slocum Creek, and at the mouth of Luke Rowe's Gut. The area to be fenced is shown on ***Figure 11-1***.

The risk for the future hypothetical residential exposure will be reduced to acceptable levels by the implementation of the site use controls (industrial uses at Site 6 and vacant land at Site 7) and the aquifer use controls that prohibit use of all groundwater beneath OU3. The risk for the future hypothetical construction worker will be reduced to acceptable levels by site use controls (vacant land at Site 7).

Monitoring will consist of the sampling of groundwater to assess the progress of natural attenuation in meeting the groundwater performance standards and to confirm that site contaminants are not migrating into the environment. Monitoring will also consist of sampling soil in the secondary source area to be treated at Site 7. The results will be compared to the soil performance standards. Monitoring will also consist of sampling surface water and sediments in Slocum Creek and Luke Rowe's Gut to confirm that site contaminants are not migrating into the environment. The details of the monitoring will be contained in the long-term monitoring plan that will be developed with federal and state concurrence. If monitoring of the groundwater and soil, as detailed in the long-term monitoring plan, indicates that the performance standards are not being met, the effectiveness of the selected remedy will be re-evaluated.

The marine ecological risk assessment was separated from the RI and will be performed under a different operable unit. Monitoring of the surface water and sediment in Slocum Creek will be used to further evaluate conditions in Slocum Creek. The details of the monitoring will be contained in the long-term monitoring plan that will be developed with federal and state concurrence. Based on the results of the monitoring, additional sampling and analysis and additional remedial actions may be required.

11.2 ESTIMATED COSTS

The estimated net present worth of Alternative 2 is $761,000 over 30 years, with a capital cost of $261,000, an annual O&M cost of $52,000 per year for the first two years, an annual O&M cost of $22,000 per year for the next 28 years, and a 5-year cost (for the site review) of $40,000. The capital cost is associated with installing the air sparge system and a fence and posting warning signs. The annual costs are for groundwater, surface water, and sediment monitoring and operation of the air sparge system.

TABLE 11-1

GROUNDWATER PERFORMANCE STANDARDS
OPERABLE UNIT 3
MCAS, CHERRY POINT, NORTH CAROLINA

Contaminant	Performance Standard[1]
VOLATILE ORGANICS (µg/L)	
Benzene	1.0
Vinyl chloride	0.015
SEMIVOLATILE ORGANICS (µg/L)	
Bis(2-ethylhexyl)phthalate	3.0
2-Methylnaphthalene	28[2]
Pentachlorophenol	0.3
PESTICIDES (µg/L)	
4,4'-DDT	0.1[3]
Dieldrin	0.0022[4]
Endosulfan I	<DL[5]
METALS (µg/L)	
Antimony	6[6]
Barium	2,000
Cadmium	5.0
Iron	300
Lead	15
Manganese	50

1 North Carolina Class GA Groundwater Standard. The standards have been updated since the RI and FS were prepared. Consequently, the values presented here are different than the values presented on Tables 6-5, 6-6, 6-7, 8-7, 8-8, and 8-15.

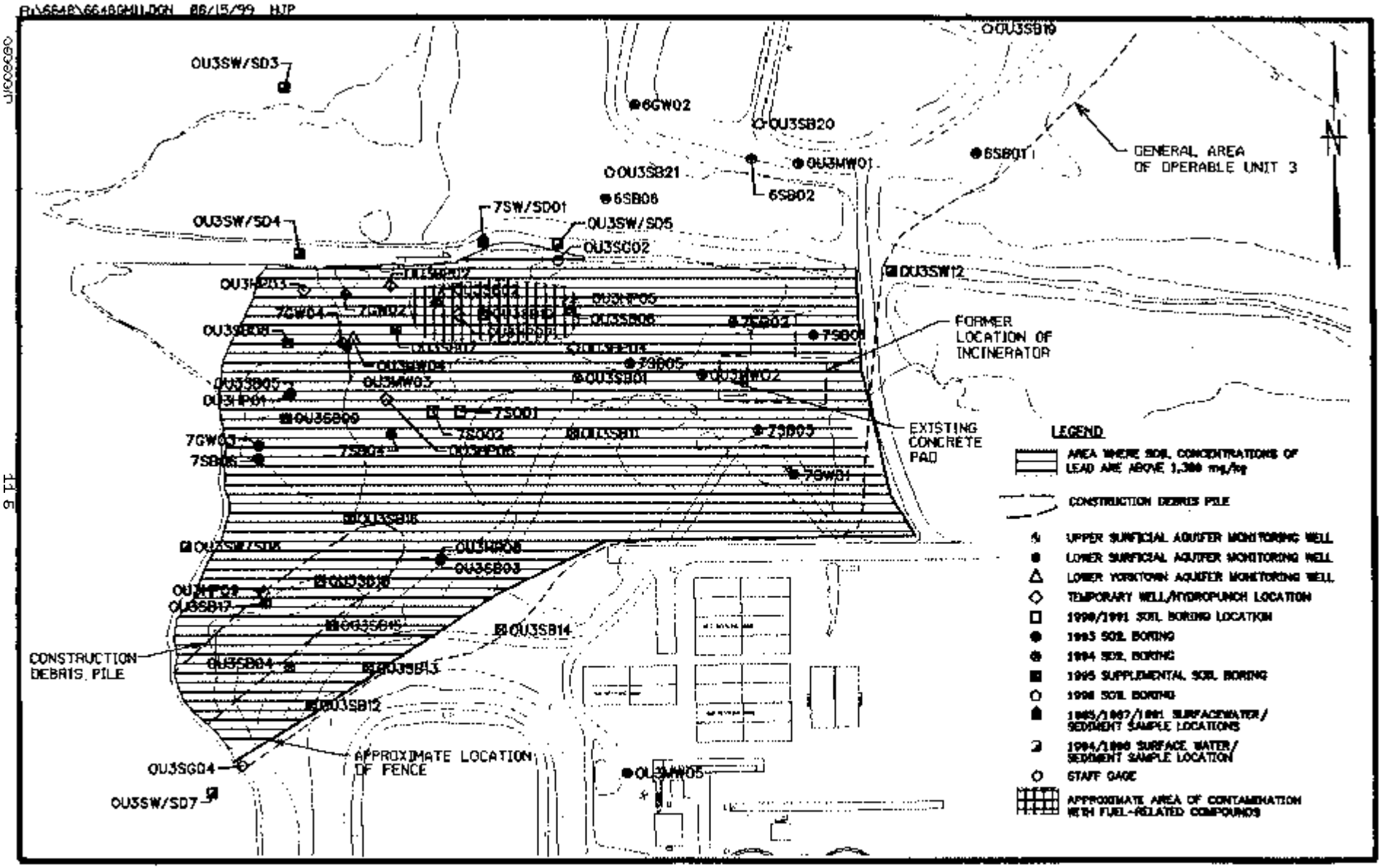
2 Interim Maximum Allowable Concentration. This standard for 2-methylnaphthalene has changed since the preparation of the RI and FS. The maximum detected concentration for 2-methylnaphthalene was 18 ug/L and no longer exceeds the standard.

3 Interim Maximum Allowable Concentration. This standard for 4,4'-DDT has changed since the preparation of the RI and FS. The maximum detected concentration for 4,4'-DDT was 0.043 ug/L and no longer exceeds the standard.

4 Interim Maximum Allowable Concentration. This standard for dieldrin has changed since the preparation of the RI and FS.

5 <DL - Less than detection limit

6 MCL



EXTENT OF SOIL CONTAMINATION
SITE 7, OU3
MCAS CHERRY POINT, NORTH CAROLINA

FIGURE 11-1

REVISION 6
AUGUST 2000

Tetra Tech NUS, Inc.

It should be noted that the cost estimate was calculated for the FS and revised based on the revisions noted in Section 13.0 and should not be considered a construction-quality cost estimate. An FS cost estimate should have an accuracy of +50 or -30 percent. The remedy could change somewhat as a result of the remedial design and construction process. Such changes, in general, reflect modifications resulting from the engineering design process. In addition, the monitoring program will be developed at the remedial design stage and could be revised during the 5-year reviews based on an of evaluation of the data collected.

12.0 STATUTORY DETERMINATIONS

Under CERCLA Section 121, the Navy and MCAS Cherry Point must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost effective, and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ as their principal element treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes. The following sections discuss how the remedy selected for OU3 meets the statutory requirements.

12.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy protects human health and the environment by eliminating, reducing, and controlling risk through institutional controls, natural attenuation of groundwater, and in-situ soil treatment. The only "unacceptable" risks posed by OU3 are under a future hypothetical residential exposure scenario (Sites 6 and 7) and a future hypothetical construction worker scenario (Site 7). Most of the risk is from ingestion of contaminated groundwater from the shallow aquifer (residents) and soil (residents and construction workers). Land use restrictions, as detailed in the LUCIP, would prevent future residential use at Sites 6 and 7 and invasive construction activities at Site 7, aquifer use restrictions would prevent the installation of wells (other than for monitoring), and fencing and warning signs would control unauthorized uses of Site 7. Soil treatment would remove a secondary source of groundwater contamination. Monitoring would provide a means of evaluating future releases of hazardous constituents to the environment, confirming that contaminants have not migrated off site, and evaluating the effectiveness of natural attenuation and soil treatment. No short-term threats are associated with the selected remedy that cannot be controlled. In addition, no cross-media impacts are expected from the remedy.

12.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Remedial actions performed under CERCLA must comply with all ARARs. All alternatives considered for OU3 were evaluated based on the degree to which they complied with these requirements. Unless a waiver was justified, the selected remedy was found to meet identified ARARs, identified in ***Tables 9-2***, ***9-3***, and ***9-4***. CERCLA Section 121(d)(4)(C) provides that an ARAR may be waived when compliance is technically impracticable from an engineering perspective. The following discussion supports attainment of pertinent ARARs.

12.2.1 Contaminant-Specific ARARs

North Carolina Class GA groundwater standards are the groundwater protection standards identified in this ROD as performance standards for remedial action.

12.2.2 Location-Specific ARARs

Performance standards are consistent with ARARs identified in ***Table 9-3***.

12.2.3 Action-Specific ARARs

Performance and treatment standards are consistent with RCRA and groundwater corrective action ARARs identified in ***Table 9-4***, and these regulations will be incorporated into the design and implementation of the remedy.

12.2.4 Other Guidance Considered

Other guidance TBCs include health-based advisories and guidance. TBCs have been used in estimating incremental cancer risks for remedial activities at the site and in determining RCRA applications to contaminated media.

12.3 COST EFFECTIVENESS

The Navy and MCAS Cherry Point believe this remedy will control risks to human health and the environment at an estimated net present worth of $761,000 over 30 years. Therefore, based on realistic exposure scenarios, the selected remedy provides an overall effectiveness proportionate to its costs, such that it represents a reasonable value for the money that will be spent.

12.4 USE OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES (OR RESOURCE RECOVERY TECHNOLOGIES) TO THE MAXIMUM EXTENT POSSIBLE

The Navy and MCAS Cherry Point, with USEPA and North Carolina concurrence, have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a cost-effective manner for final remediation of OU3. Of those alternatives that are protective of human health and the environment and comply with ARARs, the Navy and MCAS Cherry Point, with USEPA and North Carolina concurrence, have determined that this selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence; reduction in toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost, while also

considering the statutory preference for treatment as a principal element and considering USEPA, state, and community acceptance.

The selected alternative would provide permanent, long-term remedies through providing and enforcing institutional controls in the Air Station Base Master Plan to restrict entry to Site 7 (maintain as vacant land), to prohibit invasive construction activities and installation of wells, and to limit Site 6 to nonresidential and/or industrial type uses; by implementing soil treatment; and by monitoring the effectiveness of groundwater natural attenuation processes.

The selected remedy treats one of the principal threats posed by contaminated soil (secondary source area), achieving significant reductions in fuel-related constituents. This remedy provides the most cost-effective treatment and will cost less than offsite disposal. Treatment of the contaminated soil is consistent with program expectations that indicate that highly toxic and mobile wastes are a priority for treatment and that treatment is often necessary to ensure the long-term effectiveness of a remedy.

12.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

By treating the secondary source area soil using enhanced bioremediation, the selected remedy addresses one of the principal threats posed by the site through the use of treatment technologies. By using treatment as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied.

13.0 Baseline Risk Assessment for Stockpile Area

INCOMPLETE AT THIS TIME DUE TO ONGOING DATA COLLECTION

13.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for Operable Unit 3 was released for public comment on August 1, 1996. The Proposed Plan identified Alternative 2, Institutional Controls at Site 6 and Site 7, as the preferred alternative for remediation. The Navy and MCAS Cherry Point reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that several changes to the remedy, as originally identified in the Proposed Plan (and Section 9), were necessary. The changes to Alternative 2 include the following:

- Treatment of secondary sources of groundwater contamination (contaminated soil)
- Fencing all of Site 7
- Extending the Institutional Control limiting land use to vacant land to cover all of Site 7 and not just the western portion of the Site.

These changes have been incorporated into the design of the selected alternative and into the LUCIP ***(Appendix B)***

Secondary Sources of Groundwater Contamination

The change proposed here for the selected remedy is based on comments received from the State of North Carolina during the public comment period. Natural attenuation of the groundwater was an inherent component of Alternative 2. The State of North Carolina noted during the public comment period that in order for natural attenuation of groundwater to be an acceptable option, secondary sources of groundwater contamination (contaminated soil) would be required to be treated, disposed of, or controlled (as required in state regulations).

Calculations were made to determine soil concentrations that would be protective of the groundwater. These calculations were made for all contaminants detected in the groundwater at levels above State groundwater standards. In addition, soil concentrations were calculated for ethylbenzene and xylenes. These calculations were conducted using the ECTran model that was used in the FS to calculate soil concentrations protective of surface water.

The soil concentrations calculated to be protective of the groundwater were compared to the concentrations detected in the soil at Site 7. Several soil samples contained contaminants at concentrations above those calculated for the protection of groundwater. In discussions with the State of

North Carolina, it was determined that the area in the vicinity of sampling locations OU3SB02, OU3SB06, and OU3SB10 would have to be addressed as a secondary source of groundwater contamination. This area was selected because of the presence of contaminants at concentrations above those calculated to be protective of groundwater (benzene - 15 µg/kg; 2-methyl-naphthalene - 8,570 µg/kg) and above the state groundwater standards. This area measures approximately 200 feet by 70 feet and extends 4 feet below the ground surface (14,000 square feet; 2,100 cubic yards).

The area identified above will be remediated using enhanced in-situ bioremediation (air sparging). The details for this remedial activity have been determined during the pre-design phase. As noted in Section 2.2, the air sparge system has been installed. It should be noted that the State has identified new groundwater criteria, as well as calculated new soil criteria protective of groundwater. These new criteria will be used as the performance standards for OU3. As noted in Section 11.1, soil containing 2-methylnaphthalene will no longer be considered as a secondary source of groundwater contamination. The new performance standard for benzene is 5.6 µg/kg. Even with this lower performance standard for benzene, the size of the area to be treated remains approximately the same as the area noted above.

Fencing/Institutional Controls at Site 7

Data collected during the pre-design phase of the fence construction indicated the presence of lead at concentrations above 1,300 mg/kg in areas of the eastern portion of Site 7. Consequently, all of Site 7 will now be fenced, and the Institutional Controls limiting land use to vacant land will be expanded to include all of Site 7.

Evaluation of Selected Remedy (Revised Alternative 2)

As a result of these changes, it was determined that the selected alternative (Alternative 2) needed to be re-evaluated in terms of the nine evaluation criteria discussed in Section 10. The nine criteria are as follows:

- Overall protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability

- Cost
- USEPA and state acceptance
- Community acceptance

Alternative 2 would employ institutional controls, with monitoring, to reduce the unacceptable risks to human health from the ingestion of groundwater and exposure to contaminated soil. The sampling and analysis program would confirm that contaminants are not migrating to the environment, and institutional controls would restrict land use and groundwater use and limit site access. This alternative also relies on natural attenuation process to reduce organic and inorganic contaminant concentrations that exceed state groundwater standards and pose an unacceptable risk to human health from ingestion. The revised alternative employs air sparging to treat the area of contaminated soil identified above. An added benefit to the use of air sparging for treating the contaminated soil is the air sparging will also enhance the treatment of the contaminated groundwater. Consequently, the revised Alternative 2 will continue to be protective of human health and the environment. In addition, extending the Institutional Controls to include all of Site 7 increases the protection offered by this alternative.

Since the revised alternative is employing active treatment of the contaminated soil, the alternative will meet the State ARARs requiring treatment of secondary sources of groundwater contamination. The revised alternative will continue to meet ARARs that apply to groundwater.

When compared originally to the other alternatives, Alternative 2 was the least effective alternative when evaluating long-term effectiveness and permanence because soil contamination would not be actively removed. The long-term-effectiveness of the revised Alternative 2 is enhanced because of the use of air sparging to remediate the area identified as a secondary source of groundwater contamination. In addition, the revised Alternative 2 still provides continued monitoring, aquifer use restrictions, and land use restrictions, which are all adequate and reliable controls. The monitoring programs are used to determine that the alternative remains effective.

The revised Alternative 2 now provides some measure of reduction of toxicity, mobility or volume through treatment by providing treatment of the soil contamination and the groundwater contamination.

The revised Alternative 2 will continue to meet the short-term effectiveness criteria since the institutional controls can be implemented within one year. In addition, the revised Alternative 2 minimizes the risks to workers because the installation of the air sparge system does not involve excavation of the soil, minimizing the worker's exposure to contaminated soil.

The revised Alternative 2 will use conventional, well-demonstrated, and commercially available technologies that are reliable and readily implementable.

The costs for the revised Alternative 2 are still the lowest of all of the alternatives, with the exception of Alternative 1 (no-action alternative).

As noted in Section 10.3.1, the USEPA and NCDENR have concurred with the selection of Alternative 2 with the modifications outlined here and in Section 11. As noted in Section 10.3.2, it appears that the community generally agrees with the selected remedy.

During the public comment period, the State of North Carolina also expressed some concerns regarding the exceedances of surface water standards and sediment screening criteria and the reliability of the uptake modeling of contaminants through the ingestion of fish tissues by humans. In response to these concerns, the Navy and Marine Corps collected some fish tissue samples to evaluate the uptake modeling and assist in assessing the risk to human health through ingestion of fish tissue by humans.

The fish tissue sample collection was completed in October 1998, and the analytical results were received in January 1999. The evaluation of fish tissue sample results shows no potential unacceptable risk to human health from ingestion of fish tissue from Slocum Creek.

The Navy will compare the results of the fish tissue samples to the OU3 uptake model, which used surface water data to predict fish tissue concentrations, and will assess its use at other sites. The State of North Carolina and the Navy will evaluate this comparison and determine how to proceed with the evaluation of human health from fish tissue ingestion in future investigations and evaluate the use of this approach at other sites. The State of North Carolina currently recommends against the use of surface water data in uptake models to predict fish tissue concentration. The state advocates the collection of fish tissue samples when the surface water standards or sediment screening criteria are exceeded.

14.0 RESPONSIVENESS SUMMARY

14.1 BACKGROUND ON COMMUNITY INVOLVEMENT

Community relations activities to date are summarized below:

- Established information repositories.

- Established the Administrative Record for all of the sites at the Air Station.

- Released the Proposed Plan for public review in repositories.

- Released public notice announcing public comment and document availability of the Proposed Plan.

- Held public meeting on August 22, 1996, to solicit comments and provide information. No community members attended the formal public meeting. The public meeting transcript is available in the repositories and is included as ***Appendix C***.

  In addition to the public meeting held on August 22, 1996, a RAB meeting was held prior to the public meeting. Comments on the Proposed Plan were made by members of the RAB. Minutes of the RAB meeting (including comments and responses) are also included in ***Appendix C***.

  In addition, as noted in Section 13.0, the State of North Carolina also commented on the Proposed Plan. As a result, the remediation of secondary sources of groundwater contamination was added to the selected alternative.

14.2 SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND AGENCY RESPONSES

The following summarizes the responses to comments received during the public comment period. All comments were received during the RAB meeting.

1. Was there a head differential between the surficial aquifer and the Yorktown aquifer at OU3?

   Response: Yes. This situation has been encountered throughout the Air Station near surface water bodies.

2. Were contaminant levels in the surface soil compared to levels in the subsurface soil? What effect might soil contamination be having?

   Response: The fly ash was deposited in the 1950s and has been exposed to the elements since then. There was not much difference between surface and subsurface soil contaminant concentrations, and it does not appear that Luke Rowe's Gut or Slocum Creek are being impacted. Benzene has leached out of the soil and into the groundwater.

3. How readily do site-related contaminants leach?

   Response: PAHs, which are a main soil contaminant, do not readily leach because they bind to soil. The petroleum-related contamination at Site 7 has not migrated significantly. Components of gasoline can remain in subsurface areas for a long time, and the natural degradation processes can take years to complete.

4. Where do the PAHs come from?

   Response: PAHs are commonly found wherever material has been burned.

5. Is the benzene plume in groundwater migrating or dissipating?

   Response: The plume is not migrating. Samples from wells adjacent to Luke Rowe's Gut reveal no groundwater contamination. Contaminant concentrations have decreased in a well that has been sampled since 1991.

6. Does a facility exist that could treat the benzene?

   Response: Soil venting, air sparging, or bioremediation could be used to degrade the benzene.

7. Is the detection of dioxin a serious problem?

   Response: There are many types of dioxin. The types found at OU3 are the less toxic forms. The concentrations do not result in unacceptable risks levels established by EPA and the state.

8. What is the risk to people who live and work at the Air Station?

   Response: Institutional controls will address the unacceptable risks to human health (including Air Station residents and workers) at Sites 6 and 7. Human health risk assessments must be conducted for each of the operable units. Otherwise, no overall assessment can be made.

9. How many wells have been installed?

   Response: Sixteen wells have been installed at OU3.

10. Did the ecological risk assessment look at typical wildlife and aquatic life? Are any shellfish in Slocum Creek, and could they be used as bioindicators?

    Response: There is no stressed vegetation or wildlife at OU3. The risk assessment evaluated the risk from eating fish, but no fish samples have been collected. OU3 is located in closed water, which is not conducive to shellfish habitat. However, shellfish would accumulate contaminants and would be indicators of water and sediment contamination levels.

11. Why wasn't a treatment technology selected as the preferred alternative?

    Response: Lead is the main contaminant at Site 7 and is not mobile in the environment. Because the fence would prevent exposure to the contaminated soil, no traditional treatment was needed to meet the remediation objectives. Fencing is far less expensive that treatment.

12. Would it be worth using plants to remove some of the metals? Is there any uptake of lead in local vegetation?

    Response: The location with the highest concentrations of lead is inaccessible and overgrown with vegetation. The flat area does not have high levels of lead. There has been no evaluation of the uptake of lead by vegetation.

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APPENDIX A

GLOSSARY

This glossary defines terms used in this Record of Decision (ROD) describing CERCLA activities. The definitions apply specifically to this ROD and may have other meanings when used in different circumstances.

Administrative Record: A file that contains all information used by the lead agency to make its decision in selecting a response under CERCLA. This file is to be available for public review, and a copy is to be established at or near the site, usually at one of the information repositories. Also, a duplicate is filed in a central location, such as a regional or state office.

Aquifer: An underground formation of materials such as sand, soil, or gravel that can store and supply groundwater to wells and springs. Most aquifers used in the United States are within a thousand feet of the earth's surface.

Baseline Risk Assessment: A study conducted as a supplement to a remedial investigation to determine the nature and extent of contamination at a Superfund site and the risks posed to public health and the environment.

Carcinogen: A substance that may cause cancer.

Cleanup: Actions taken to deal with a release or threatened release of hazardous substances that could affect public health and the environment. The noun "cleanup" is often used broadly to describe various response actions or phases of remedial responses such as a Remedial Investigation and Feasibility Study.

Comment Period: A time during which the public can review and comment on various documents and actions taken, either by the Department of Defense installation or USEPA. For example, a comment period is provided when USEPA proposes to add sites to the National Priorities List.

Community Relations: The Navy and MCAS Cherry Point program to inform and involve the public in the Superfund process and respond to community concerns.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA). The act created a special tax that goes into a trust fund, commonly known as "Superfund," to investigate and clean up abandoned or uncontrolled hazardous waste sites. Under the program, USEPA can either (1) pay for site cleanup when parties responsible for the contamination cannot be located or are unwilling

or unable to perform the work or (2) take legal action to force parties responsible for site contamination to clean up the site or reimburse the federal government for the cost of cleanup.

Drinking Water Standards: Standards for the quality of drinking water that are set by both the USEPA and NCDENR.

Explanation of Differences: After adoption of a final remedial action plan, if any remedial or enforcement action is taken, or if any settlement or consent decree is entered into, and if the settlement or decree differs significantly from the final plan, the lead agency is required to publish an explanation of significant differences and why they were made.

Feasibility Study: See Remedial Investigation and Feasibility Study.

Groundwater: Water beneath the earth's surface that fills pores between materials such as sand, soil, or gravel. In aquifers, groundwater occurs in sufficient quantities such that it can be used for drinking water, irrigation, and other purposes.

Hazardous Substances: Any material that poses a threat to public health or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.

Information Repository: A file containing information, technical reports, and reference documents regarding a Superfund site and made available to the public. Information repositories for Marine Corps Air Station Cherry Point are at the Havelock Public Library, 300 Miller Boulevard, Havelock, North Carolina and the MCAS Cherry Point Library, PSC Box 8019, Building 298, "E" Street, Cherry Point, North Carolina.

Maximum Contaminant Level (MCL): National standards for acceptable concentrations of contaminants in public drinking water systems. These are legally enforceable standards for suppliers of drinking water set by the USEPA under the Safe Drinking Water Act.

Monitoring Wells: Wells drilled at specific locations on or off a hazardous waste site where groundwater can be sampled at selected depths and studied to assess the groundwater flow direction and the types and amounts of contaminants present.

National Priorities List (NPL): The USEPA list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial response using money from the trust

fund. The list is based primarily on the score a site receives in the Hazard Ranking System. USEPA is required to update the NPL at least once a year.

Parts Per Billion (ppb)/Parts Per Million (ppm): Units commonly used to express low concentrations of contaminants. For example, one ounce of trichloroethene in a million ounces of water is 1 ppm. One ounce of trichloroethene in a billion ounces of water is 1 ppb. If one drop of trichloroethene is mixed in a competition-size swimming pool, the water will contain about 1 ppb of trichloroethene.

Preliminary Remediation Goals: Screening concentrations that are provided by USEPA and NCDENR and are used in the assessment of the site for comparative purposes before remedial goals are set during the baseline risk assessment.

Proposed Plan: A public participation requirement of SARA in which the lead agency summarizes for the public the preferred cleanup strategy and the rationale for preference, the alternatives presented in the detailed analysis of the Feasibility Study, and presents any waivers to cleanup standards of CERCLA Section 121(d)(4) that may be proposed. This may be prepared either as a fact sheet or a separate document. In either case, it must actively solicit public review and comment on all alternatives under agency consideration.

Record of Decision (ROD): A public document that explains which cleanup alternative(s) will used at an NPL site. The ROD is, based on information and technical analysis generated during the Remedial Investigation and Feasibility Study and consideration of public comments and community concerns.

Remedial Action (RA): The actual construction or implementation phase that follows the remedial design of the selected cleanup alternative at an NPL site.

Remedial Investigation and Feasibility Study (RI/FS): Investigation and analytical studies usually performed at the same time in an interactive process and together referred to as the "RI/FS." They are intended to (1) gather the data necessary to determine the type and extent of contamination at a Superfund site, (2) establish criteria for cleanup of the site, (3) identify and screen alternatives for remedial action, and (4) analyze In detail the technology and costs of the alternatives.

Remedial Response: A long-term action that stops or substantially reduces a release or threatened release of hazardous substances that is serious, but does not pose an immediate threat to public health or the environment.

Removal Action: An immediate action performed quickly to address a release or threatened release of hazardous substances.

Resource Conservation and Recovery Act (RCRA): A federal law that established a regulatory system to track hazardous wastes from the time of generation to disposal. The law requires safe and secure procedures to be used in treating, transporting, storing, and disposing of hazardous wastes. RCRA is designed to prevent new uncontrolled hazardous waste sites.

Response Action: As defined by Section 101(25) of CERCLA, means remove, removal, remedy, or remedial action, including enforcement activities related thereto.

Responsiveness Summary: A summary of oral and written public comments received by the lead agency during a comment period on key documents and the responses to those comments prepared by the lead agency. The responsiveness summary is a key part of the ROD, highlighting community concerns for decisionmakers.

Secondary Drinking Water Standards: Secondary drinking water standards are set by USEPA and NCDENR. These guidelines are not designed to protect public health. Instead they are intended to protect "public welfare" by providing guidelines regarding the taste, odor, color, and other aesthetic aspects of drinking water that do not present a health risk.

Superfund: The trust fund established by CERCLA that can be drawn upon to plan and conduct cleanups of past hazardous waste disposal sites and current releases or threats of releases of non-petroleum products. Superfund is often divided into removal, remedial, and enforcement components.

Superfund Amendments and Reauthorization Act (SARA): The public law enacted on October 17, 1986, to reauthorize the funding provisions and to amend the authorities and requirements of CERCLA and associated laws. Section 120 of SARA requires that all federal facilities "be subject to and comply with this act in the same manner and to the same extent as any non-government entity."

Surface Water: Bodies of water that are above ground, such as rivers, lakes, and streams.

Volatile Organic Compound (VOC): An organic (carbon-containing) compound that evaporates (volatilizes) readily at room temperature.

APPENDIX B

LAND USE CONTROL IMPLEMENTATION PLAN (LUCIP)

MCAS CHERRY POINT OU3

GENERAL

By separate Memorandum of Agreement, hereinafter referred to as the Land Use Control Assurance Plan (LUCAP), the U.S. Environmental Protection Agency (USEPA); the North Carolina Department of Environment and Natural Resources (NCDENR); and the Department of the Navy (Navy) on behalf of U.S. Marine Corps Air Station, Cherry Point, agreed that the Navy and the U.S. Marine Corps (Marine Corps) shall follow certain procedures for implementing and maintaining site-specific land use controls. Those procedures are contained in the LUCAP, and, for Operable Unit 3 (OU3), this Land Use Control Implementation Plan (LUCIP). The LUCAP is intended to ensure that all of the Department of the Navy's site-specific selected remedies with land use controls remain protective of human health and the environment. This LUCIP and its requirements are part of the selected remedy within the Final Record of Decision (ROD).

The parties to the LUCAP also agree that the efficacy and protectiveness of the land use controls within this LUCIP is contingent upon the Department of the Navy's substantial good-faith compliance with those procedures applicable to the selected remedy. Should such compliance not occur or should the LUCAP be terminated, the parties agree that the protectiveness of the selected remedy may be reconsidered by any party, and additional remedial measures may be necessary to ensure that the selected remedy remains protective of human health and the environment.

This document is the LUCIP for MCAS Cherry Point OU3. OU3 is comprised of the following sites: Site 6 Fly Ash Ponds, and Site 7 – Old Incinerator and Adjacent Area. This LUCIP is an attachment to and a part of the ROD for these sites.

The Navy and the Marine Corps will, pursuant to the LUCAP, include the land use controls set forth in this LUCIP within the Installation's Geographic Information System (GIS) and the base master planning process. Pursuant to the LUCAP paragraph IV.a, the Installation will provide written notification to the State and USEPA when the requirements of this paragraph have been met.

All proposed changes to this LUCIP will be submitted to the state and USEPA for review and concurrence prior to implementation. Changes to this LUCIP will, if required under the National Oil and Hazardous Substances Pollution Contingency Plan, be reflected in changes to the selected remedy made through the appropriate process (e.g., Explanation of Significant Differences, ROD amendment).

The parties agree that the Navy's annual certification of land use control implementation is necessary for as long as the Navy retains ownership of the site. NCDENR maintains this annual certification is part of

the selected remedy. The Navy and Marine Corps maintain that this annual certification is a procedure to implement the selected remedy and is not a part of the selected remedy. Nevertheless, all parties agree that a written certification is desirable. Accordingly, pursuant to the LUCAP paragraph V.b., MCAS Cherry Point will provide certification annually to USEPA and NCDENR that the land use controls within the ROD remain implemented.

SITE BOUNDARY IDENTIFICATION

The geographic boundary for these sites is identified on ***Figure B-1***. This boundary indicates the outermost border of all controlled portions of the site (i.e., no areas subject to land use restrictions lie outside this boundary). The outermost boundary indicates the area of restricted land use and aquifer use. Contaminated soil areas and groundwater contamination exist within this outermost boundary.

Also shown on ***Figure B-1*** are the restricted areas for intrusive activities (Site 7) and the location of fencing to restrict site access.

SITE USE CONTROLS

The land use at OU3, Site 6 will be restricted to industrial use. Prohibited land uses include, but are not limited to, residences, schools, playgrounds, daycare centers, and retirement centers. The land use at OU3, Site 7 is restricted to vacant land. All uses are prohibited.

Unless specifically excepted by both NCDENR and USEPA, intrusive activities (e.g., excavation of soil or insertion of objects into the ground except for monitoring and remediation activities associated with this remedy) are prohibited within the geographic boundary of Site 7. See ***Figure B-1***.

AQUIFER USE CONTROLS

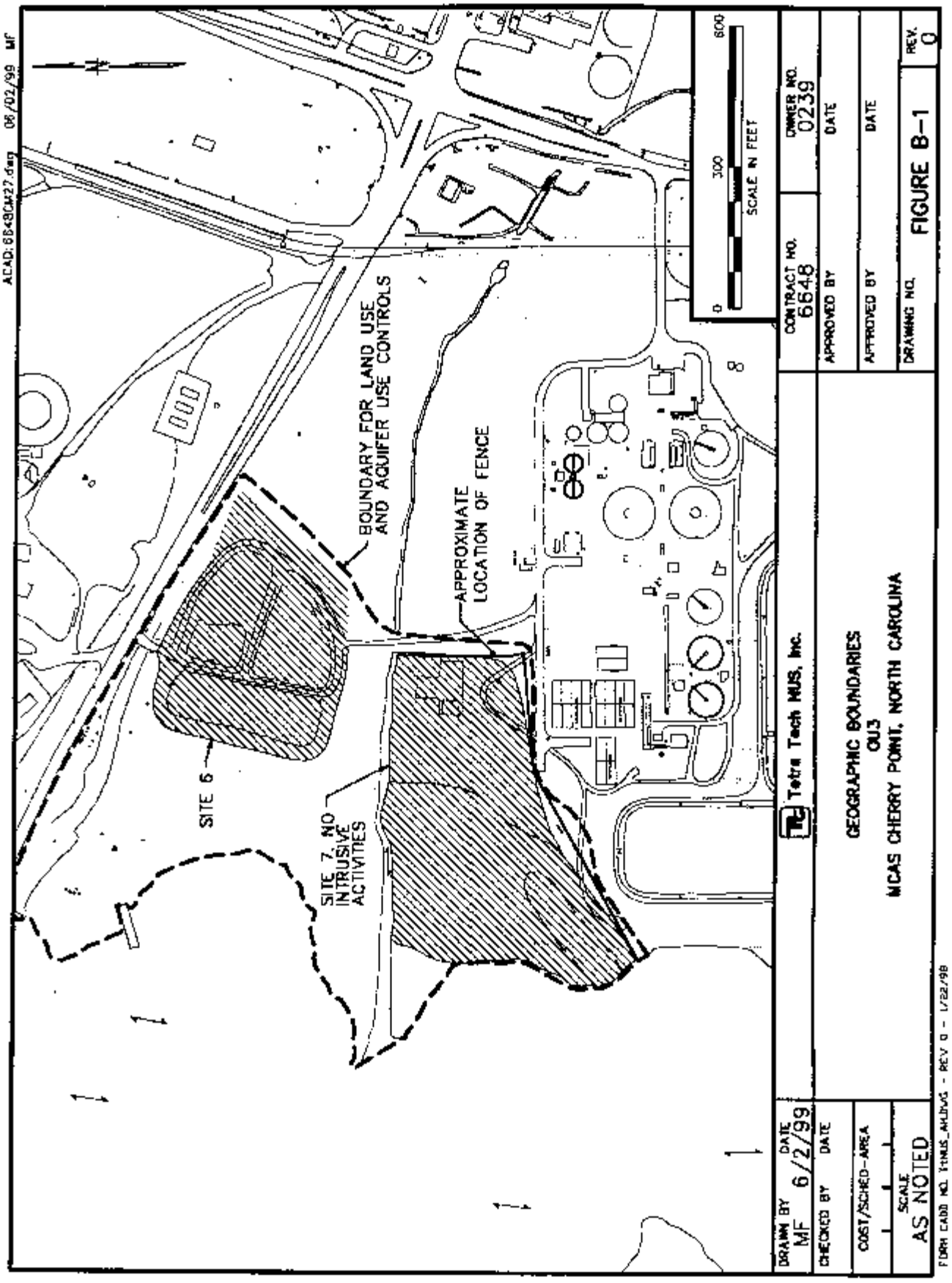
Except for monitoring purposes or as specifically excepted by NCDENR or USEPA, all use of groundwater beneath OU3 is prohibited. In addition, the installation of any well, other than those constructed for monitoring purposes and remediation activities associated with this remedy as authorized by North Carolina Administrative Code Title 15A, Chapter 2C as amended, Well Construction, is prohibited. See ***Figure B-1***.

SITE ACCESS CONTROLS

Site access to Site 7 is restricted to authorized personnel only. Site access controls will include the installation and maintenance of a fence around Site 7 and the placement of warning signs along the fence, along Slocum Creek, and at the mouth of Luke Rowe's Gut to warn all unauthorized person to stay out. The signs shall contain the following warning – Restricted Area, For Entry, and shall contain a phone number for a point of contact.

NOTIFICATION

Following the procedures outlined within the LUCAP, MCAS Cherry Point shall file a Notification of Inactive Hazardous Substance or Waste Disposal Site meeting the requirements of NCGS 130A-310.8.


ACAD: 6648GM27.dwg 06/02/99 MF
BOUNDARY FOR LAND USE AND AQUIFER USE CONTROLS
APPROXIMATE LOCATION OF FENCE
SITE 6
SITE 7, NO INTRUSIVE ACTIVITIES
SCALE IN FEET
0
300
600
Tetra Tech NUS, Inc.
GEOGRAPHIC BOUNDARIES
OU3
NCAS CHERRY POINT, NORTH CAROLINA
CONTRACT NO. 6648
OWNER NO. 0239
APPROVED BY
DATE
APPROVED BY
DATE
DRAWING NO.
FIGURE B-1
REV. 0
DRAWN BY MF
DATE 6/2/99
CHECKED BY
DATE
COST/SCHED-AREA
SCALE AS NOTED
FORM CADD NO. TtNUS_A1.DWG - REV 0 - 1/22/98

APPENDIX C

TRANSCRIPT OF PUBLIC MEETING

TRANSCRIPT OF PUBLIC MEETING

OU3 REMEDIAL ALTERNATIVE

AUGUST 22, 1996

COPY

STATEMENT OF WORK
MARINE CORP AIR STATION CHERRY POINT
CTO 238

PUBLIC MEETING
CITY OF HAVELOCK
1 HATTERAS AVENUE
HAVELOCK, NORTH CAROLINA

T-R-A-N-S-C-R-I-P-T

* *

TRANSCRIPT OF PUBLIC MEETING TAKEN IN THE CITY OF HAVELOCK, CRAVEN COUNTY, NORTH CAROLINA, AT THE HAVELOCK CITY AUDITORIUM, BEGINNING AT 8:00 P.M., THURSDAY, AUGUST 22, 1996.

INTRODUCTIONS - CAPTAIN JEFF HEARN
PUBLIC AFFAIRS OFFICE AT CHERRY POINT

PRESENTER - MR. GREG ZIMMERMAN
BROWN & ROOT ENVIRONMENTAL

COORDINATOR - MS. BETSY HORNE
COMMUNITY RELATIONS SPECIALIST
BROWN & ROOT ENVIRONMENTAL
55 JONSPIN ROAD
WILMINGTON, MAINE 01887-1062

COURT REPORTER - DEBBIE HADDOCK NICHOLS

INDEX OF POSTER BOARD EXHIBITS

CAPTAIN HEARN: RIGHT NOW IS THE OFFICIAL PART OF THE PUBLIC ENVIRONMENTAL MEETING. WHAT WE HAVE HERE IS BROWN AND ROOT ENVIRONMENTAL GROUP READY TO PRESENT THE PROPOSED REMEDIAL ALTERNATIVE PLAN FOR OPERABLE UNIT 3. FIRST OFF, I'D LIKE TO TAKE CARE OF SOME FORMALITIES. I AM THE PUBLIC AFFAIRS OFFICER FROM CHERRY POINT, CAPTAIN JEFF HEARN. LET ME LAY SOME GROUND RULES FOR THIS MEETING. NUMBER ONE, IF YOU WOULD LIKE TO MAKE PUBLIC COMMENT, THERE ARE THREE WAYS TO DO THAT. YOU CAN STAND, PLEASE RECOGNIZE YOURSELF, AND FROM THERE ASK YOUR QUESTION. SECONDLY, IF YOU DO NOT FEEL COMFORTABLE IN SPEAKING IN THIS FORUM, THERE IS A COMMENT CARD. PLEASE PUT YOUR NAME, YOUR ADDRESS, AND YOUR COMMENT, AND PUT IT OVER IN THE BOX--THE GREEN BOX IN THE CORNER OF THE ROOM. THEN YOUR COMMENT WILL BE ANSWERED. THIRDLY, YOU CAN SEND IT TO MY OFFICE, THE PUBLIC AFFAIRS OFFICE, MARINE CORPS AIR STATION, CHERRY POINT, PSC BOX 8013, CHERRY POINT, NORTH CAROLINA, 28533. THOSE ARE THE THREE WAYS TO MAKE COMMENTS. BROWN & ROOT IS PREPARED TO GIVE THEIR PRESENTATION AT THIS TIME. IS THERE ANY INTEREST IN THE PUBLIC TO HEAR THEIR PRESENTATION? LET THE RECORD SHOW THAT NO ONE MADE COMMENT. AT THIS TIME, I AM OPENING THE FLOOR FOR OFFICIAL COMMENT ON THE PROPOSED REMEDIAL ALTERNATIVE PLAN FOR OU-3. LET THE RECORD SHOW THAT THERE IS NO COMMENT. SINCE THERE IS NO PUBLIC COMMENT, WHAT I WOULD LIKE TO DO IS TURN THIS MEETING BACK TO THE INFORMAL MEETING

AND CONTINUE WITH THE RESTORATION ADVISORY BOARD FORUM.
THANK YOU.
* *
PROCEEDINGS CONCLUDED AT 8:15 P.M.

STATE OF NORTH CAROLINA)
) C-E-R-T-I-F-I-C-A-T-I-O-N
COUNTY OF PITT)

I, DEBBIE HADDOCK NICHOLS, A COURT REPORTER AND NOTARY PUBLIC IN AND FOR THE AFORESAID COUNTY AND STATE, DO HEREBY CERTIFY THAT THE FOREGOING PAGES ARE AN ACCURATE TRANSCRIPT OF THE HAVELOCK PUBLIC MEETING, WHICH WAS TAKEN ON BEHALF OF BROWN & ROOT ENVIRONMENTAL, BY ME BY STENOMASK, AND TRANSCRIBED BY ME PERSONALLY.

WITNESS, MY HAND AND SEAL, THIS DATE: AUGUST 28, 1996.

MY COMMISSION EXPIRES JUNE 26, 2000.

Debbie Haddock Nichols

DEBBIE HADDOCK NICHOLS
COURT REPORTER AND NOTARY PUBLIC
CAROLINA COURT REPORTERS, INC.
102 OAKMONT PROFESSIONAL PLAZA
GREENVILLE, NC 27858

MINUTES OF RESTORATION ADVISORY BOARD MEETING
OU3 REMEDIAL ALTERNATIVE
AUGUST 22, 1996

CHERRY POINT MARINE CORPS AIR STATION
RESTORATION ADVISORY BOARD MEETING
AUGUST 22, 1996
MINUTES

The RAB meeting was held at the Havelock City Auditorium, to be followed by a public meeting on the preferred alternative for OU3. Community members present were Grace Evans, Pat McClellan-Green, and Neil Scarborough; Navy and Marine Corps members Lance Laughmiller (LANTDIV), Renee Henderson, and Rachel Johnson (MCAS CP EAD); regulatory members Linda Raynor and Richard Powers (NCDEHNR), and Gena Townsend and her successor, Jay Bassett (EPA); and Natural Resource Trustee Alex Cardinal (USGS). Also present were Waverly Hampton (LANTDIV); Marybeth Fennell (EAD); Cynthia Tschaepe (OHM); Susan Dubuque (Management Edge); and Matt Cochran, Greg Zimmerman, and Betsy Horne (B&RE). Henry Sermons had called to say he was on vacation. Other community members not present were Lew Mitchell and Gene Smith. The meeting began at 7:05 pm and ended at 8:00 pm.

Rachel Johnson, the Marine Corps Co-Chair, began by asking if the members had received the last meeting's minutes, which stated that Grace Evans had been elected Community Co-Chair. Rachel emphasized the importance of each member contacting either Grace or Rachel if they were going to be unable to attend a RAB meeting.

Rachel also reviewed some housekeeping issues:

> Those RAB members who did not sign the charter that was adopted at the last RAB meeting need to do so. The sheet was passed around for signatures. Linda Raynor promised to obtain Bath Hartzell's signature and return the original sheet to Rachel.
>
> Rachel asked that each member identify an issue or concern that should be the focus of a RAB presentation or workshop. A sheet was passed around to record these issues. Those proposed include: risk to fish, bioaccumulation, DoD risk evaluation, human health risk assessment, cost controls, hydrology, remediation methods, and basic chemistry including degradation (dioxin, arsenic, PCBs. Jay Bassett will obtain ATSDR sheets on the list of contaminants that Rachel provides).
>
> Rachel and Grace are anxious to enhance MCAS Cherry Point's community outreach program. Rachel passed around examples of fact sheets other bases have created and requested suggestions from the RAB members.

OU3 Presentation

Greg Zimmerman opened his presentation by indicating how MCAS Cherry Point would accept public comment on the proposed approach to OU3: by receiving oral comment at the public meeting scheduled to follow the RAB meeting, by considering comments written on a card at

the meeting, or by receiving written comment addressed to the MCAS Cherry Point Public Affairs Office no later than August 30.

Greg placed the OU3 action in perspective by stating that the meeting would be the third scheduled to elicit public comment on a proposed remedial approach to cleaning up discrete areas of contamination at the Air Station. The first was to address PCBs at Sites 5 and 17; the second, in June, was for OU1 groundwater contamination.

OU3 is comprised of Sites 6 and 7, combined because of their proximity and similarity of contamination. Site 6's three ponds were used from the 1940s to 1970s to dispose of fly ash from the power plant and from 1980 to 1994 of lime alum sludge from the drinking water treatment plant. Site 7, used from 1949 to 1955, was where waste petroleum and lubricants were burned, either in an incinerator or on the ground. Fly ash was disposed on the western portion of Site 7 that is now overgrown.

Greg reviewed the Superfund process: the remedial investigation studies the problem to determine the type of contamination present and how widespread it is; that information is the basis for the feasibility study, which identifies cleanup objectives, analyzes remedial technologies, evaluates the technologies against the nine EPA-mandated selection criteria; this information is used to develop a proposed remedial action plan, which presents all the foregoing in a short straight-forward document that also identifies the alternative that MCAS Cherry Point prefers to address site contamination. Once a public comment period is held on the proposal, a record of decision on the plan is signed, selecting the remediation approach that will be used. A period to design the remedial approach is followed by the cleanup action itself and long-term monitoring to ensure that the remedy is working as designed.

For OU3, MCAS Cherry Point has undertaken four major investigations and two supplemental studies to collect samples of soil, groundwater, surface-water and sediment from Luke Rowe's Gut and Slocum Creek, as well as lime alum sludge. Analysis revealed:

Site 6 -	metals, pesticides, and dioxin (soil) metals, pesticides (groundwater)
Site 7 -	metals, PAHs, pesticides, and VOCs (soil) metals, pesticides, PAHs, and VOCs (groundwater at levels above the State of North Carolina standards)

The human health risk assessment was conducted using the latest guidance from EPA, including evaluating current and future land uses and receptors. Maintenance workers and adolescent trespassers were the receptors evaluated under the current land use (vacant land). Construction workers, full-time employees, and adult/child residents were the receptors evaluated under a future land use (industrial and residential) scenario. These land uses were evaluated even though MCAS Cherry Point is not planning on using the land at OU3 for those purposes. Adult recreational users of Slocum Creek were also evaluated.

The results of the human health risk assessments indicated that no "unacceptable risks" exist under current conditions and that the only receptors exposed to "unacceptable risks" were the construction workers at Site 7 and the adult/child residents at both Sites 6 and 7. The risks

would be the results of drinking the groundwater in the surficial aquifer. The surficial aquifer at MCAS Cherry Paint is currently not used.

In addition, lead was detected in the soil at Site 7 at levels above EPA screening levels for soils in industrial and residential settings.

The ecological risk assessment evaluated the effect of the contamination on the eastern cottontail rabbit, the red fox, and the red tail hawk.

Greg reviewed the nine criteria EPA has established against which each alternative must be evaluated. Seven alternatives were considered in the feasibility study. These include:

1. Sites 6 and 7: No action

2. Sites 6 and 7: Institutional controls

3. Site 7: In-situ fixation/solidification of surface soils: Sites 6 and 7: Institutional controls

4. Site 7: Excavation and offsite disposal of surface soils: Site 6 and 7: Institutional controls

5. Site 7: Excavation, onsite ex-situ fixation/solidification and reuse of surface soils as fill; Sites 6 and 7: Institutional controls

6. Site 7: Soil cover; Sites 6 and 7: Institutional controls

7. Site 7: Partial dewatering, excavation, and offsite disposal of surface/subsurface soils: Sites 6 and 7: Institutional controls

The proposed approach is to implement alternative 2, institutional controls, which includes enclosing a portion of Site 7 with an 8-foot fence and posting warning signs in the area, as well as instituting long-term monitoring for OU3. Limits on the use of the surficial aquifer and portions of Site 7 would be memorialized in the MCAS Cherry Point Master Plan. The Plan is similar to a zoning map, detailing each area of the Station and what plans exist for them. Greg added that the objectives of the remediation were to prevent people from being exposed to the contaminated soil or the contaminated groundwater now or in the future. In addition, since the State has identified an area of soil with high benzene content coinciding with a plume of benzene in the groundwater, MCAS Cherry Point will begin to evaluate alternatives to remediate that area.

Comment from Pat McClellan-Green: She has a number of environmental management students for the academic year that would benefit from having a workshop on the MCAS Cherry Point IR program. One of them may also be interested in interning for the lR program.

Response by Rachel Johnson: Rachel and Renee will contact her directly to discuss both matters.

Question from Alex Cardinell: Was there a head differential between the Surficial Aquifer and the Yorktown Aquifer at OU3?

Response by Greg Zimmerman: Yes. It is a situation we have encountered throughout MCAS Cherry Point near surface water bodies.

Question from Grace Evans: Was there a comparison made of contaminant levels between the surface and subsurface soil? What effect might it be having?

Response by Greg: The fly ash was deposited in the 1950s and has been exposed to the elements for the last 40 years. All soil samples were collected in the space from the top of the water table to the soil surface. There was not much difference in levels and it does not appear that Luke Rowe's Gut or Slocum Creek are being impacted. Groundwater samples indicate very low contaminant levels are present. Linda Raynor added that benzene and gasoline have leached out of the soil and into the groundwater.

Question from Grace Evans: What is a receptor?

Response by Greg: A receptor is anything that is at risk from a source of contamination through contact from skin exposure or ingestion (eating or drinking). Adult activities like smoking at contaminated sites are a form of hand-to-mouth exposure to the contamination. Also, children often eat dirt as they play on the ground.

Question from Lance Laughmiller: How readily do site-related contaminants leach?

Response by Greg: PAHs do not readily leach because they bind to the soil. Petroleum contamination in the subsurface soils has stayed there.

Question from Grace: Isn't that unusual?

Response by Gena Townsend: Components of gasoline can remain in subsurface areas for a long time, even years. Lance added that the degradation process can take decades to complete.

Comment from Pat McClellan-Green: You've indicated that the contamination is sporadic. Please explain:

Response by Greg: The contamination at Site 7 is not found throughout the site. Most of it is in one location. The benzene plume is beneath only part of the site.

Question from Alex Cardinell: What did you find is happening to the plume? Is it migrating or dissipating?

Response by Greg: In the well that has been sampled three or four times since 1991, levels have dropped. Samples from wells adjacent to Luke Rowe's Gut reveal no groundwater contamination and surface water samples from both Luke Rowe's Gut and Slocum Creek show no risk.

Question from Jane Sharpe, Grace's guest: Just how serious is it that you have found dioxin?

Response by Greg: Many types of dioxin exist. The kind found at OU3 contains high levels of chlorine, which are the less toxic form of dioxin. The levels found are below the unacceptable risk levels established by EPA and the State.

Question from Jane Sharpe: What is the risk to people who live and work on the Station?

Response by Greg: Human health risk assessments will be conducted for each operable unit. No overall assessment can be determined otherwise.

Question from Waverly Hampton: What about the PAHs discovered?

Response by Greg: PAHs are commonly found at locations wherever material has been burned.

Question from Grace: How many wells have been installed?

Response by Greg: There are 16 wells on either side of Luke Rowe's Gut.

Question from Rachel Johnson: What are ARARs?

Response by Greg: They are the federal and state regulations and guidance that must be complied with in determining how the site should be remediated.

Question from Alex: Does a facility exist that could treat the benzene?

Response by Greg: A soil venting process (like a vacuum) could be employed that would produce no dust. Air sparging or bio solve could be used to degrade the benzene.

Question from Alex: Is there a code to document the groundwater model you used? Our groundwater specialist was not familiar with it.

Response by Greg: Brown & Root combined a couple of models to create the one used for OU3. Matt Cochran added that Corry Rich had been dealing with Jody Eimers at USGS.

Question from Waverly: Did the ecological risk assessment look at the typical critters?

Response by Greg: A site visit revealed no stressed vegetation or wildlife at OU3. Although the ecological risk assessment evaluated the risk to ingesting fish, no fish samples have been taken.

Question from Alex: Are there any shellfish in Slocum Creek and could these shellfish be used as bioindicators?

Response by Grace and Pat: OU3 is located in closed water, which is not conducive to shellfish habitat. However, shellfish would be bioaccumulators and indicators of water and sediment contamination levels. Gena added that no fish samples were collected, consistent with EPA requirements. No risk-based concern was triggered by the results of the initial screening. If the screening results do not exceed the triggering level, no hard core sampling is necessary.

Pat pointed out that the fish that have died are not sediment dwellers.

Question from not recorded: Why was a treatment technology not picked as the preferred alternative?

Response by Greg: Lead is not mobile in the environment. Since the fence would prevent anyone from being exposed to the contaminated soil, no traditional technology was needed to meet the OU3 remediation objectives. The estimated fence cost is about $26,000 to construct, with maintenance of about $432,000 over 30 years. In contrast, alternative 7, the most aggressive of the alternatives evaluated, generated an estimated $2.6 million in construction costs. Even if all the soil was excavated, long-term monitoring would be required.

Question from Grace: Would it be worth planting biota such as the Indian mustard plant at OU3 to take up some of the metals?

Response by Greg: The location of the highest concentrations of lead is in that portion of Site 7 that is inaccessible and overgrown with vegetation. The flat area does not contain high lead levels.

Question from not recorded: Are you seeing any uptake of lead in local vegetation?

Response by Greg: That has not been evaluated.

Information generated as Pat asked a series of questions based on her review of the OU3 documents included:

Latex gloves are often the cause for phthalate ester detections during the laboratory analysis.

Signs will be placed along the edge of Luke Rowe's Gut and Slocum Creek.

Language in the ROD will need to be approved by the State in order to ensure that the benzene remaining in soil locations is guaranteed to be addressed.

More surface water samples will be taken at Site 7 around the flat area.

The work at Site 6 is not being done because of any risk, but rather as a part of general maintenance.

Jay Bassett was introduced. Jay will be succeeding Gena as EPA's Remedial Project Manager for MCAS Cherry Point. He has worked for EPA for 6 years, preceded by work for the Navy. Jay begins as EPA's RPM on August 23.

The next RAB meeting will be scheduled for sometime in October. [At the Partnering meeting the following morning, a decision was made to tie the next RAB meeting to the date and location of the next Partnering meeting. The October Partnering meeting is scheduled for October 8 at the Hampton Inn in Morehead City.]